WORLD PETROLEUM

JUNE 1961

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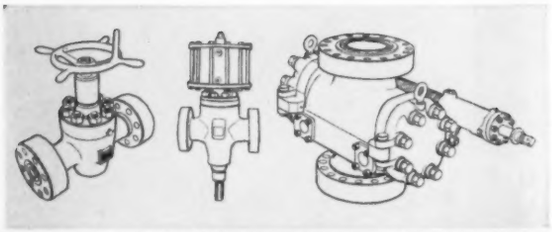

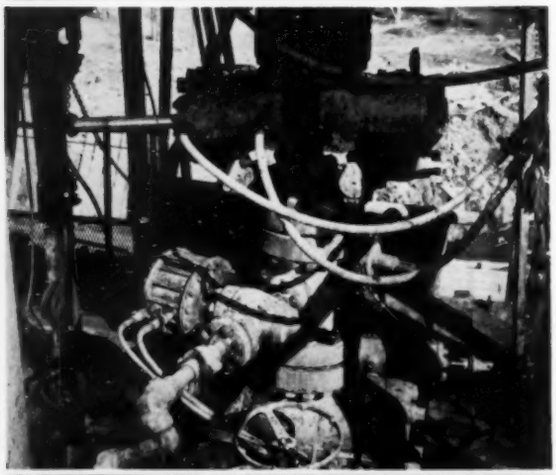

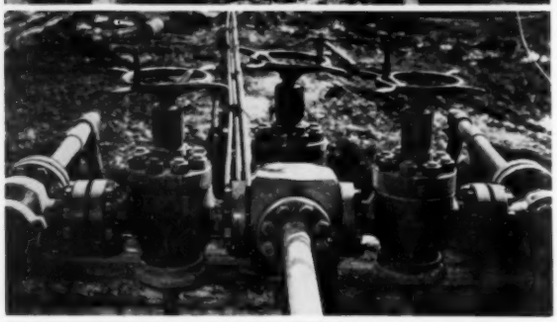

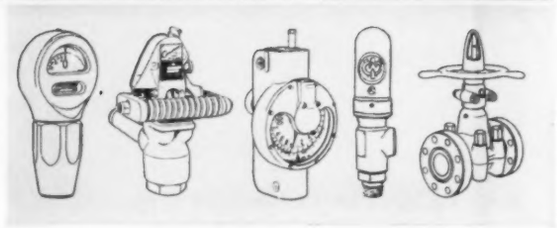

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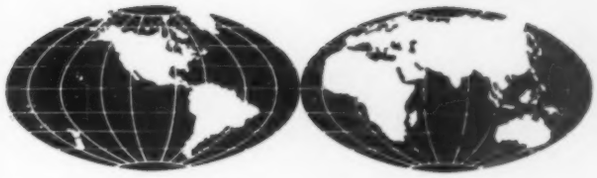

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World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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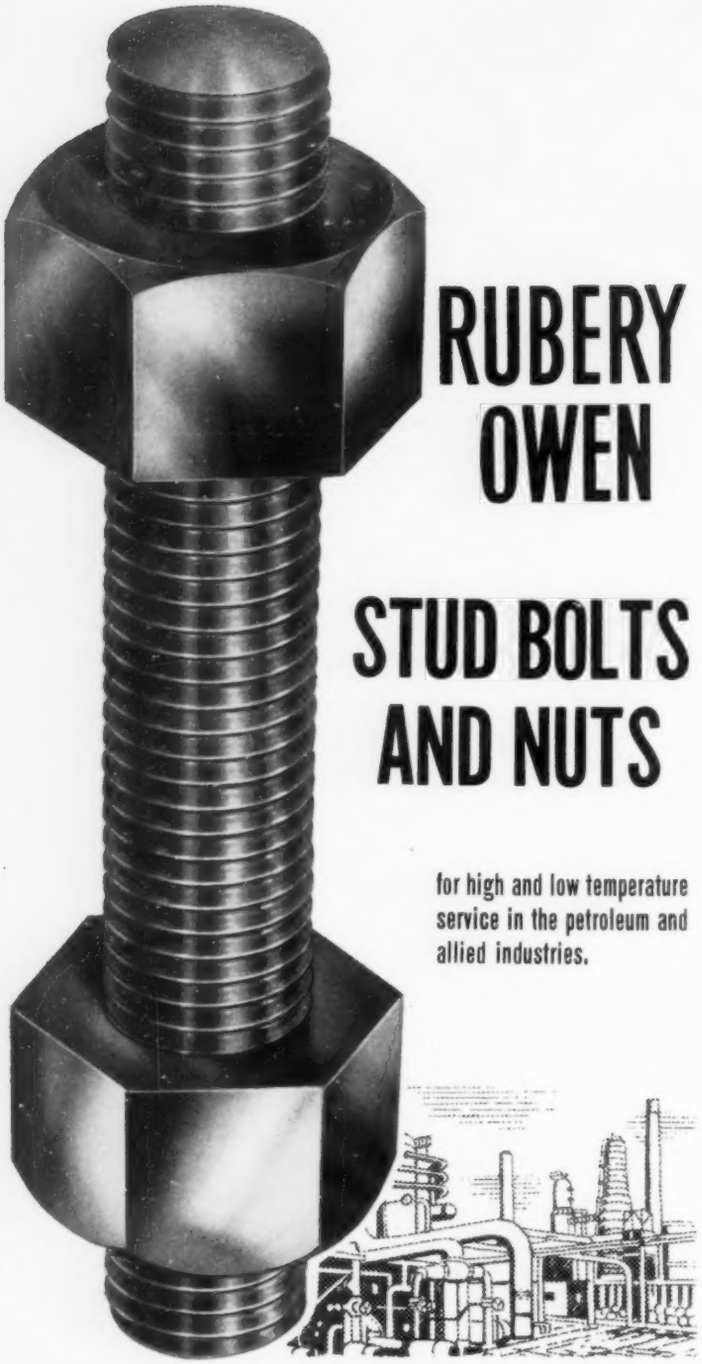
THIS MONTH'S COVER

Ancient civilizations in Mexico created art forms in architecture such as the rain gods shown at the left and fantastic animal designs similar to that shown at the right.



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by Joseph B. Huttlinger

Udall Under Fire

Stewart L. Udall, the youthful Secretary of the Interior, rapidly is becoming the most controversial figure in President Kennedy's Cabinet. In his post, Udall is the key man in Washington for oil and gas.

In the early days in his new job, the former Congressman from Arizona was chided by a Democrat, Rep. Wayne Aspinall, of Colorado, chairman of the House Interior committee, for press releases saying the Department of the Interior plans new "policies." Aspinall reminded Udall that the Congress makes "policy" and government agencies carry it out. And, Aspinall asked the Secretary in dedicating projects to make clear that the project is a joint product of Congress and the executive branch.

But Udall spoke of "policy" even after that.

Later, Udall came under fire from Republicans. First, it was for use of public works projects to corral votes for the President's aims with Congress. Udall defended this as good politics. Then, it was for trying to blame former President Eisenhower for the fiasco in Cuba. Finally, House Republicans began to call for Udall's resignation, charging that he is turning Interior Department into the "propaganda arm" of the Kennedy administration.

Import Controls Lasting

The program to limit imports of crude oil and products to the United States seems likely to emerge from the current studies as more permanent than ever. There now appears virtually nothing in sight for the immediate future or down the road to end the program.

One witness after another from the ranks of independent producers spoke up for continuing the program. Inland refiners had good words for it. And even some oil importers see some need for the program, however grudgingly. While the Kennedy administration may make some changes in details of the program—about levels of imports, who can import and exemptions—a sweeping overhaul is unlikely.

Administration officials hope to announce these changes in time to go into effect by July 1, and there are signs they can make this deadline. It would be folly to try to forecast the changes, but some trends appear clear. Thus, there are more signs that the levels of allowed crude and product imports will be cut than raised. The floor for historic importers is under heavy attack, and may be dropped further. Quotas for inland refiners who cannot physically use the imported crude were attacked but even more vigorously defended. The sliding scale for refiners, allowing smaller refiners a larger share of their runs in imports, was stoutly defended. The Canadian and Mexican exemptions are receiving attention, due to sharp increases ahead in imports from Canada and due to the Brownsville "loophole" on the South. There is much sentiment for giving the Import Appeals Board real power to grant relief. Higher tariffs face an uphill fight to win approval, and country quotas find even less welcome.

Gas Price Controls

Once again, federal price controls over natural gas production are up for attention in the U. S. Congress. This time, President Kennedy opened up the subject. The President proposed an action which many independent producers of gas regard as intolerable. But the proposal can hardly be ignored by the Congress. So, hearings are in the making.

Chairman Oren Harris, D., Ark. of the House Commerce committee, promptly got together with gas industry leaders in hopes of working up a counter proposal to ease up federal price and other controls over gas producers. This proposal would come up in any hearings this year or next.

President Kennedy's proposal was for a bill to exempt about 3,800 producers selling less than two billion cubic feet a year from federal price controls. The President proposed "vigorous handling" of the other 270 producers.

This is the idea first advanced by Sen. Paul Douglas, D., Ill., who is no friend of gas and oil producers. Three House members beat the Presi-

Pipeline

dent to the punch by putting in bills to carry out the idea. They are Representatives John Dingell, D., Mich.; Torbert Macdonald, D., Mass.; and John E. Moss, D., Calif.

Despite all this, the odds are against passage of any legislation to clear up price controls over gas producers. So, the present chaos is likely to continue for some time to come. This situation sees the FPC directed to control the price of gas, but without rules or standards as to how to do it. Almost in desperation, the FPC launched last year its "area price ceiling" basis, but this is still to be worked out.

Down the road there looms one other possible—or probable development. By July, the President will have named three members of the commission—a majority—and they may act without a law to exempt the smaller producers as the President asked. The White House feels the commission could do just that; others feel a bill is absolutely essential for this.

In his message to Congress on the FPC and other agencies, the President also proposed:

(1) Exemption from FPC of construction "to enlarge, extend or replace existing facilities" for present customers. (2) FPC to be given power to put in escrow rate increase under bond pending FPC decision. (3) Expanding FPC to seven members. (4) FPC's chairman to serve at "pleasure" of the President. (5) Power for panels of FPC members to decide cases. (6) More power and pay for FPC examiners.

FPC Keeps Up

President Kennedy to the contrary, Federal Power Commission is on top of its construction applications. The backlog of $850 million recently is the lowest in years, although construction filings are at an alltime high. And $144 million of the backlog has a temporary authorization for construction. Finally, many millions of the backlog are tied up because gas companies failed to file complete applications. The President told Congress that the backlog of construction work is "just as serious" as the "incredible backlog" of rate cases. The facts seem different.

Private Visits to FPC Curbed

President Kennedy reacted to cases of *ex parte* contacts at the Federal Power Commission and other agencies by asking Congress for a law directing FPC and other agencies to bar private visits in connection with pending cases. He also proposed a series of other actions to preserve the integrity of government and its officials. Action follows headlines stemming from disclosures in this publication back in 1959 of private visits by Thomas G. Corcoran, an attorney with the Tennessee Gas Transmission Co. on the eve of an FPC decision in a big gas case.

Depletion Upheld

The income tax depletion allowance is safe from any attack by President Kennedy and his administration at least for 1961. That was the main news in the President's tax message to Congress late in April. The President proposed other tax changes, but didn't mention oil's depletion provision.

But the President did promise a thorough study of current tax laws and provisions and to propose a major reform next year. While he did not mention depletion, there are many who feel this is under study.

Anti-oil Senators scolded the President for not going after the depletion in this year's message, and said that this indicates that oil and gas interests may have reached the new president. In any event, President Kennedy will have to ask changes in the depletion provision or else claim that it is a fair tax provision.

Pipeline Gas Controls Set

Prodded by the courts, Federal Power Commission has hammered out a firm policy for price control over pipeline-owned gas.

It held Panhandle Eastern Pipe Line Co. to a "cost of service" price, instead of the "commodity value" as Panhandle asked. And, it took away benefits of the income tax depreciation allowance, in allowing Panhandle "only the taxes payable" not phantom taxes that would have been paid. The decision sets certain precedents.

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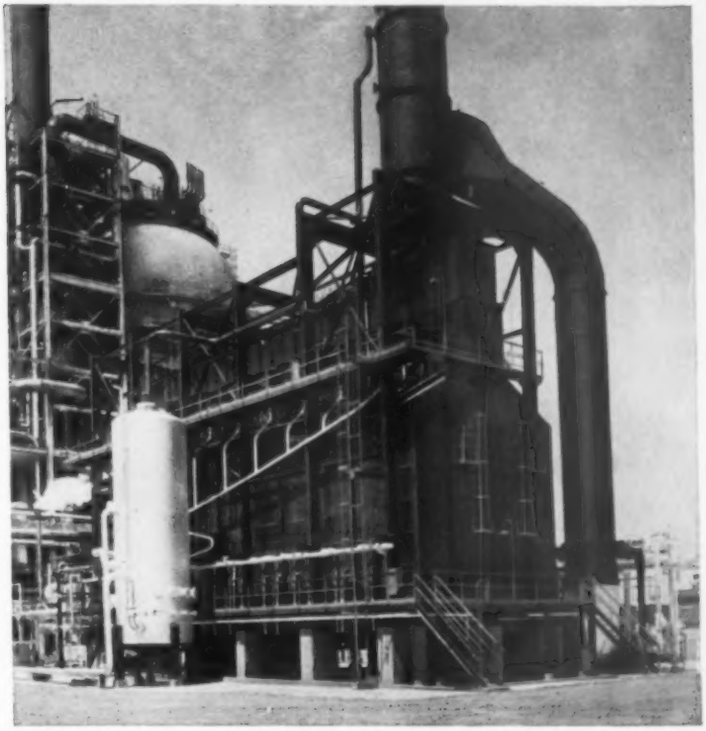

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Humble Bayway knew exactly what they wanted in a replacement heater and turned confidently to Lummus to meet their difficult design requirements.

First, the heater had to be large enough to service this giant Cat-Cracker; now one of the largest in operation.

Secondly, Humble wanted a high thermal efficiency, 86% as compared with the usual 75-80%. In the Lummus design, the heater utilizes Ljungstrom Air Preheater and integrated blower and duct system to attain high thermal efficiency. Operating performance has been consistently high. Humble's big fuel savings have more than made up for the slightly higher capital investment for air preheat equipment.

Finally, there was one other difficult design condition. The new heater would be required to operate for long periods without shutting down for maintenance or cleaning. The Lummus design included steam soot blowers which have kept both the bare tubes and studded tube in the convection section clean. The heater fires on heavy residual fuel oil having a very high solids content.

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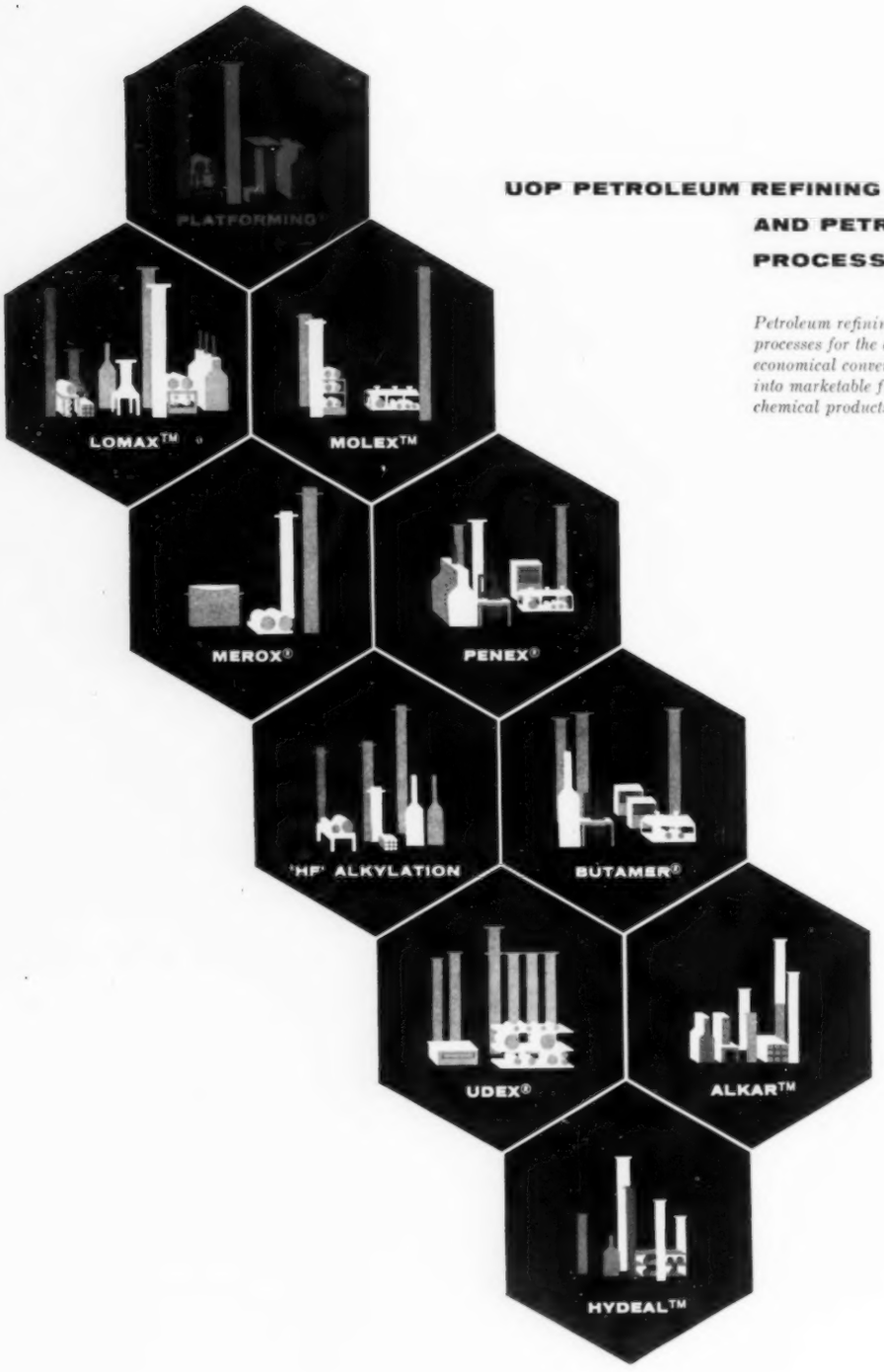

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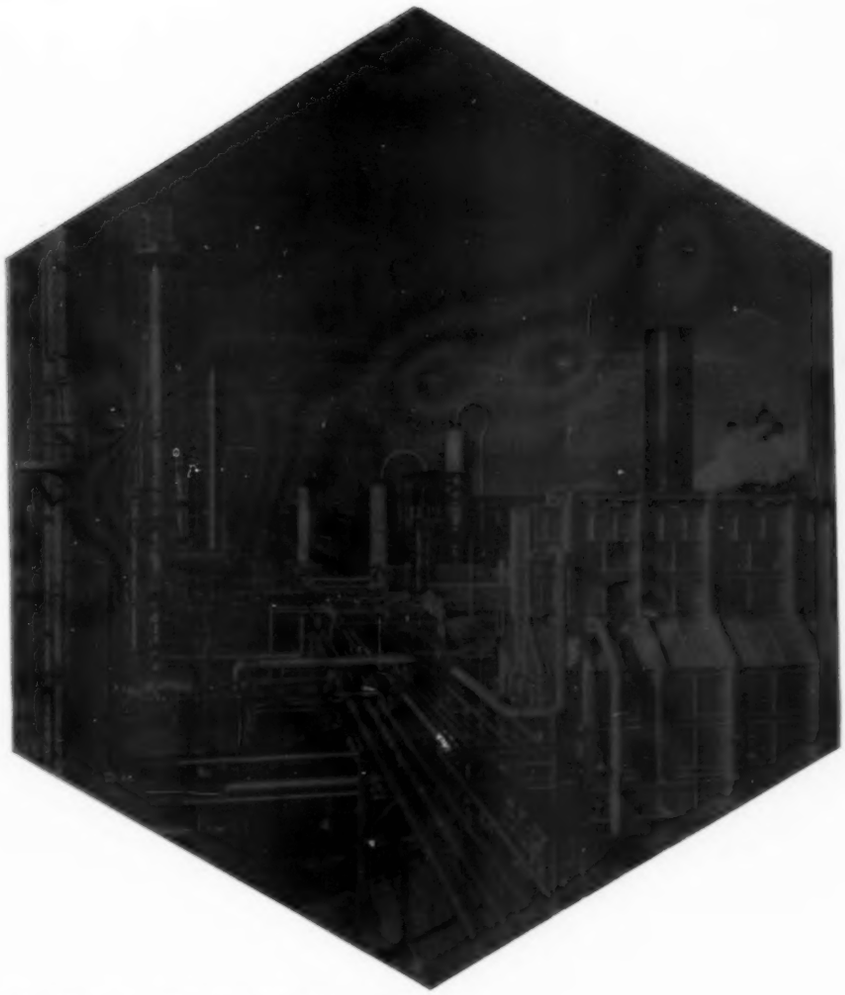

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BP's New Angle Bay Ocean Terminal

British Petroleum's new £6½ million ocean terminal at Angle Bay in Milford Haven, capable of berthing two 100,000-dwt tankers in 54 ft of water and supplying its Llandarcy refinery via a 62-mile 18-in. pipeline—the longest in the British Isles—was opened formally by the Minister of Power, Richard Wood, on April 20, though it has been in commercial operation for some months. The 50,000-dwt "British Queen," flagship of the BP tanker fleet and the first of the eleven 50-70,000-tonners on order, was being unloaded on the occasion of the opening and the 42,000-ton "British Ambassador" was also at the terminal.

Coming three days after the Budget, there was natural interest among many as to how the minister would explain his government's volte-face in fuel policy. Ignoring this completely, all he said was that the immense significance of the future of the terminal was in no way diminished by the new taxes, and he went on:

"Some commentators have suggested that it is naive to suppose its purpose was to raise revenue and not to give protection to coal. I emphatically deny this and willingly accept any charge of naivete because, and this is the main reason, I am convinced that coal is in no need of such protection.

"Few things are certain, but one thing I may say. This tax will barely check the growth of oil in our economy and more and more oil in the future will certainly come to Britain. . . . If the British industry follows the trend which is predicted for the free world as a whole, our refineries in the UK should double their output by the early 1970s."

M. R. Bridgeman, BP chairman, said the scale of company operations in Wales will shortly be increased by developments at the other end of the pipeline, where work is beginning on the new petroleum chemical works at Baglan Bay near Llandarcy.

Speaking of the remarkable recreation of the old Popton Fort into administrative offices for the terminal, Mr. Bridgeman said that "this picturesque building, which would otherwise have ended its days as an eyesore, has now been brought back to a useful purpose and will, I hope, long be preserved."

A technical description of the new Angle Point terminal will be given in a later issue.

BHC's New Baglan Bay Works

British Hydrocarbon Chemicals Ltd. (British Petroleum and Distillers) has now cleared about 100 acres of sand dunes at its new Baglan Bay Works for the first stage of the project for producing chemicals from petroleum due for completion in late 1962.

Feedstock will be a light distillate from BP's Llandarcy refinery, about three miles away, and initial operations will be based on a steam cracker producing a gas stream from which olefins, ethylene, propylene and butadiene will be separated. Further products are planned.

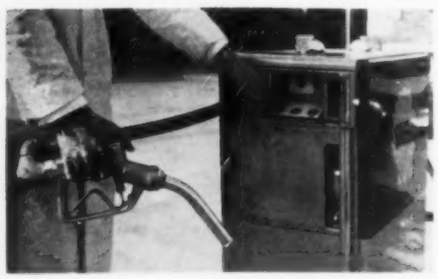
Some of the ethylene will go to another BHC unit on the site for combination with chlorine purchased from another source for the production of ethylene dichloride. This plant is a duplicate of one nearing completion at the company's Grangemouth works. The balance of the ethylene will be used for making styrene monomer in another new plant being built on the Baglan site by Forth Chemicals Ltd. (BHC and Monsanto Chemicals).

The butadiene will be sold for the manufacture of synthetic rubber and other copolymers, and this output will supplement that of BHC at Grangemouth, where one extraction plant has been operating since 1956 and a second is due on stream later this year.

Stone & Webster Engineering Ltd. will build the ethylene plant and butadiene extraction unit, and The Lummus Co. Ltd. the ethylene dichloride plant.

"Tele-Reader" Fuelling

Wayne Tank & Pump Co. Ltd. recently demonstrated at its Bracknell (Berkshire) works the prototype of a new system of motor fuel retail dispensing —"Tele-reader" Fuelling—developed to meet Shell International Petroleum's requirements. This prototype conforms with British weights and measures authorities and is to be installed for commercial use at a local "Shell" station.



Under this system, envisaged as long ago as 1941 and patented towards the end of the war, the three basic elements—(a) electrically-driven pump, meter and integrator, (b) dispensing point, and (c) read-out sales indicator—are separated and sited where most convenient for forecourt flexibility and efficiency. Normally pumps and meters will be installed adjacent to storage tanks placed away from the forecourt area and thus tanker deliveries need no longer hamper normal station work.

The electro-mechanical indicator, the "Telereader" with large easily-read figures showing the grade being delivered, the cost per gallon (or other unit) and the total sales value, is sited in the motorist's direct vision through his windscreen. After delivery, by quantity or price, an interlocking device ensures the automatic return of drum readings to zero. With the dual "Tele-reader"' units contained in a single Fibreglass housing (illuminated at night), the demonstration showed how each reader is connected by push button control to indicate from any of the products offered and how two vehicles can be fueled simultaneously with different products. Further flexibility can be provided by operating several readers simultaneously with each dual hose group. An important feature claimed for this new system is the easy replacement of individual parts and the low overall maintenance cost.

While the prototype is a simple 4-product unit with dual "Tele-reader," the system is claimed to lend itself readily to incorporating such additional devices as presets and octane blending, etc. Without increasing the number of "fill-points," the system could offer two customers, each simultaneously, a choice of nine grades of gasoline plus diesel and gasoline/oil 2-stroke mixture.

F. J. Stephens

D. H. Barran

New "Shell" Chairman

F. J. Stephens has been appointed chairman of the board of The "Shell" Transport and Trading Co. Ltd. to succeed Lord Godber, who has expressed a wish to retire on June 30 next after being a member of the board since 1928, a managing director since 1935 and chairman since 1946. Mr. Stephens has been a member of the board since 1951 and a managing director since 1957. In accordance with usual practice, he will cease to be a managing director of the Royal Dutch/Shell group of companies.

H. Wilkinson, CMG, a managing director of the group and who has been a member of the "Shell" Transport and Tradjng board since 1949, has been appointed a managing director of the company.

D. H. Barran, at present president of Asiatic Petroleum Corp., New York, has been appointed to the "Shell" board and from July 1 will be a managing director of The Shell Petroleum Co. Ltd. and a principal director of Bataafse Petroleum Mij., thereby replacing Mr. Stephens as a managing director of the Royal Dutch/Shell group.

£50 Million Tax on "Heavy" Oils

The UK Government has departed in no uncertain measure from its oft-reiterated assertion that no steps would be taken that would deprive the industrial consumer of his free choice of fuel.

"For the purpose of obtaining extra revenue," as the Chancellor of the Exchequor put it in his 1961/62 Budget, a tax of 2d a gallon was imposed on April 17 on kerosine and gas, diesel and fuel oils. Put more realistically, a tax of £2 to £2 7s a ton.

Such oils have been tax-free since 1947, when the ld/gal imposed in 1933 was repealed at a time of acute coal shortage and when every inducement was being offered by the government to industrialists to change to oil. "The same conditions do not apply today," said the Chancellor.

The duty on lubricating oil has also been raised from ld/gal—at which rate it has stood from 1933—to 3d/gal, or around £3 2s 6d a ton.

The yield from these changes is estimated at £48 million in the present financial year and £50 in a full year, and total Exchequor receipts from hydrocarbon oil duties for 1961/62 at £438 million against a 1960/61 yield of £408 million.

While the 2s 6d/gal tax on gasoline and diesel engine roal fuel remains unchanged, the cost of the annual car license goes up from £12 10s to £15.

Calculations made by Petroleum Information Bureau based on 1960 deliveries of "heavy" oils into consumption give an indication of the additional burdens which individual categories of users will have to bear —and thus the cost of finished products in the end. Altogether the cost would have been of the order of £45.3 million, of which £39.6 million would have come from gas, diesel and fuel oils. As to industries, it would have added £10.6 million to the cost of public electricity generation and £4.7 to steel manufacture. Industrial users of fuel oil for central heating would have paid some £6 million more and farmers an extra £1.2 million for gas and diesel oil used in agricultural power units.

Commenting on this tax reimposition, *The Times* said it was "no more commendable than any other general addition to costs," and that although the Chancellor asserted it was for revenue purposes "only the most naive would suppose that the question of protecting the coal industry at the expense of the industrial consumer was ignored."

It would be outside the scope of these notes to mention the many quarters from which objections have come but it is at least interesting to note that

(Continued on page 10)

Photographed at Standard Oil of Ohio, (Toledo Refinery)

The constant challenge and the continuous answer

The demand for ever-superior fuels from refiners is constant. The search for ever-better catalysts to help produce these fuels is continuous. At the oil companies and at Cyanamid, the searchers have found that each challenge can best be met by pooling knowledge and resources. In a word, the continuous answer lies in *cooperation*.

Cooperation with refiners helped Cyanamid develop an answer in Aerocat® micro-spheroidal synthetic catalyst. Aerocat provides high activity, stability, and selectivity through controlled physical properties. You can depend on Aerocat for efficient overall performance and satisfactory product realization.

The Cyanamid "Man with the Golden Rule" played an important role in developing Aerocat and other catalysts. His job is not simply to sell. His job is to help you in your continuous task to meet the constant challenge. Behind his know-how are the resources of a major catalyst producer that is also a major manufacturer of other chemicals – Cyanamid. When you need further information, write to:

CYANAMID INTERNATIONAL
General Chemicals Department
30 Rockefeller Plaza, New York 20, N. Y.
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CYANAMID

(*Continued from page 8*)

not even the National Union of Mineworkers appears completely in favor. It has recalled that while it had advocated to the government restrictions on the use of fuel oil, it had also urged that any tax imposed should be counterbalanced by a reduction in the duties on other kinds of oil—in other words, on gasoline.

Oil-Based Hydrogen at Billingham

Imperial Chemical Industries is to spend over £6 million on modernizing a large section of its Billingham Works. This will include the installation of a highly efficient process developed by the company for making hydrogen at a lower cost than in the past as the first stage in the manufacture of ammonia, fertilizers and many other Billingham Division products.

A radical change is that this process will use light oil as raw material instead of coke. The coke ovens, now nearing the end of their useful life and consuming some 600,000 ton/yr, will be shut down. Preliminary site work is now in progress and the new plants will start to come into use in 1963. Existing plants will continue to operate during the changeover and full production of all Billingham Division products will be maintained while the new units are being commissioned.

BP-California and Grange Chemicals

BP-California Ltd. was registered as a private company in March with a nominal capital of £500,000 in "A" and "B" £1 shares in equal amounts. The "A" are all held by British Petroleum Co. and the "B" by California Chemical SA., of Geneva, subsidiary of Standard Oil of California.

The company's object is the manufacture of aromatic hydrocarbons. It forms part of the "BP-California" £7 million project and a plant is already under construction on the site of BP's Kent refinery. This will have an annual capacity of 19,000 tons of orthoxylene, 16,000 tons ethylbenzene and 22,000 tons paraxylene, with production scheduled to start late this year. A similar plant is to be built at BP's Dinslaken refinery in West Germany.

A subsequent announcement states that Grange Chemicals Ltd. is developing plans actively to make 15,000 tons/yr of phthalic anhydride at Grangemouth based on the Kent orthoxylene output. Until recently this material has been manufactured from coal tar naphthalene. California Chemical Co. holds a one-third interest in Grange Chemicals, the other two-thirds being made by British Petroleum and Distillers.

ICI To Refine Crude Oil

An important step in the vertical integration of Imperial Chemical Industries' production of chemicals from petroleum is announced. The company is to handle crude oil for the first time and its Heavy Organic Chemicals Division is to build and operate a distillation plant with about a million tons a year initial capacity and costing "several million pounds." Completion is set for before the end of 1962. This will be on a 250-acre site on the north bank of the River Tees and adjacent to the pipeline linking the company's works at Wilton and Billingham. A new jetty will be built to handle crude deliveries and the shipment of products.

Crude will be supplied by Shell-Mex and B.P. and plant design will permit the handling of various types. It will give a range of end products but its primary function will be to provide a portion of the light distillate (naphtha) required for the three olefine plants at Wilton, previously supplied by SM and BP. The latter will also market the other products of the distillation unit.

"Revertex" to Make Latices

Yet another entrant to the field of synthetic rubber manufacture in the UK is announced. Revertex Ltd., whose wide range of products has in the past all been based on natural rubber, has reached agreement with the International Latex Corp., of Dover, Delaware, to form a new joint company to manufacture a range of synthetic latices in the UK. This company will also have the right to export to many countries abroad. A sum of about £665,000 is being realized from Revertex shareholders by means of a bonus share issue and negotiations are in hand for a 60-acre site near Grimsby (Lincolnshire). No indication is given of plant capacity but it is stated that the size of the site will allow ample room for subsequent expansion.

International Latex has been making these materials successfully in the US for a number of years and Revertex believes this accumulated knowledge and experience will be of the greatest value to the new company.

Maleic Anhydride at Wilton

A plant with 10,000 tons/year capacity of maleic anhydride when fully developed is to be built at Wilton by Imperial Chemical Industries' heavy organic chemicals division. This will be based on air oxidation of butane and is a further step in utilizing the products of the Wilton olefin plants as chemical raw material.

Fawley-Severnside Pipeline

Constructors John Brown Ltd. has been awarded the contract for laying Esso Petroleum Co.'s 78-mile, 6-in., ethylene pipeline from Fawley refinery to Imperial Chemical Industries' new Severnside Works near Bristol. Cost is put at £850,000, including easements and compensation, and completion is expected this year. Stewarts & Lloyds will supply the 2,700 tons of steel line pipe required.

Expansion of Marketing by Independents

Several interesting developments have occurred in the expansion of gasoline retailing by independent companies. Total Oil Products (G.B.) Ltd., British marketing subsidiary of Cie. Francaise des Petroles, has entered the "heart" of London for the first time by its acquisition in March of a large garage in Brompton Road, Kensington, regarded as one of London's "prestige" filling stations. Previous London retail outlets have all been on the outskirts.

The Rank Organization has now opened its first station. This has a 140-ft frontage and is built on the site of the car park of its main cinema in the city of Worcester. Five pumps are provided and all grades of Esso motor fuels are on sale by gallonage or cash value. Further stations are contemplated.

Jet Petroleum Ltd. will build an ocean terminal near Newcastle costing about £250,000 and with capacity up to 50,000 tons. This will nearly double its existing storage, now confined to three depots in Lincolnshire and Suffolk. The company is reported to be now supplying nearly 400 retail stations with its cut-price gasoline and the new terminal is said to be part of a plan to extend marketing operations northwards.

UK and US Per Capita Consumption

An interesting table in the OEEC report, "Oil: Recent developments in the OEEC area," a new study issued recently by the Oil Committee, shows changes in metric tons of consumption of petroleum products per capita in member countries in comparison with the US for 1955 to 1959. Reliable statistics of this nature are very rare. Converted into US gallons by the recommended multiplication factor of 300, the figures and changes for the UK and US are as follows:

	UK	US	UK	US
	US gal per Cap.		*% Over Previous Year*	
1955	126.0	757.5	—	—
1956	136.8	774.6	+ 8.6	+2.3
1957	134.1	762.0	— 2.0	—1.6
1958	167.7	768.9	+25.1	+0.9
1959	195.3	784.5	+16.5	+2.0

Other 1959 per capita consumption figures (in US gallons) for OEEC countries are: Iceland, 696.0; Sweden, 425.7; Denmark, 290.4; Norway, 260.1; Belgium, 197.4; Netherlands, 193.2; Switzerland, 189.3; Luxembourg, 180.6; France, 139.2; Germany, 132.0; Ireland, 114.3; Austria, 103.8; Italy, 92.7; Greece, 57.9; Portugal, 36.4; and Turkey, 15.9. For the OEEC area as a whole, excluding Spain, the figure is 130.2.

UK Polythene Plants for Soviet Bloc

Contracts valued provisionally at £7 million have been received by the Simon Engineering Group for the design and erection of four polythene plants, one each in Czechoslovakia, East Germany, Poland and Romania. Capacity is reported as "a potential of 24,000 ton/yr each." Under a separate contract, the necessary "know-how" is to be furnished by Imperial Chemical Industries—the first time the company has sold its secrets of this manufacturing process to Eastern Europe; the amount to be paid for this has not been disclosed but the total value of the two contracts has been reported as of the order of £11 million. All specialized equipment will be of British manufacture and Simon-Carves Ltd. will assist in plant construction and also in bringing the plants on stream.

Slush Pump Development

Reporting progress in the development of the rig inventions of Hew D. Fanshawe, described in WORLD PETROLEUM of November 1960, the National Research Development Corp. states that a program of detailed design study and scale model building has been completed. Arrangements are now being discussed with manufacturers, oil companies and other interested parties for the construction and testing of a full-scale prototype rig in the UK. It is understood that on the technical side development has continued to make steady progress since the NRDC report for the year to June 30, 1960, was issued recently.

These inventions are concerned with the automatic handling of drill pipes whilst running in and pulling out the drilling string for bit changing and other purposes with the object of reducing unproductive time, particularly in deep drilling operations. By their use a considerable measure of automatic operation can be achieved and the crew on the rig reduced.

WORLD PETROLEUM learns that development of the pressure exchange slush pumps has now been made an independent project by Dowty Rotol Ltd., of Cheltenham (Glos.). The reason for this is that they clearly have commercial value independent of the rest of the project and, in fact, development of these pumps is now far in advance of the rest of the rig.

Appointments

A. McGILVRAY has been appointed to succeed the late T. T. McCreath as chairman of Attock Oil Co.

H. H. CHANDLER, who is taking up an appointment with Texaco Inc. in New York, has resigned from the Regent Oil board.

New Publications

"A Glossary of Petroleum Terms"—The Institute of Petroleum's third edition of this work, first published in 1931 and now revised and enlarged to 40 pages to cover the whole of the industry's branches from drilling and production to marketing and standardization. Definitions are arranged in alphabetical order for easy reference and any terms defined in the glossary are italicized in the other definitions in which they occur.

Numerous definitions of petroleum and allied terms which occur in the various legal enactments in the UK and also a list of abbreviations of titles of official and other bodies are given in appendices.

Copies from the IP, 61 New Cavendish Street, London, W.1, price 5s., post free.

"Impalco Aluminum: Technical Data"—The 66 pages in this Imperial Aluminum Co. publication are devoted to extensive details of characteristics, chemical, physical and mechanical properties, and other useful typical values of "Impalco" products. Its four main parts cover (i) aluminum, (ii) aluminum alloys.: non-heat-treatable, (iii) alloys: heat treatable and (iv) brazing materials and other products. In addition there are six tables covering such aspects as (a) weights of plate, sheet, strips, etc., (b) composition limits, and (c) typical properties of alloys and their comparison with other metals.

Copies free from the company at P. O. Box 216, Witton, Birmingham 6.

Petroleum Information Bureau Memos—Recent new information memoranda issued by this body include (a) Oil in the USA (2 maps), (b) Oil in the USSR (1 map), (c Oil in Western Europe (2 maps with numerous insets but restricted to oilfields and refineries, and (d) Transportation of oil—Tankers. Available free from PIB, 29 New Bond Street, London, W.1.

"Tanker Freight Statistics"—All aspects of this subject are covered, mostly for a long period of years, in this valuable 32-page reference publication compiled by the London tanker brokers and managers Harley, Mullion & Co. Ltd., 35-37 Camomile Street, London, E.C. 3. Typical of the many tables (practically all with accompanying large graphs) are (a) weekly freight indices (Scale basis) 1953-60, and (b) volume of tonnage fixed and average time charter rates (soft and hard currency) 1952-60.

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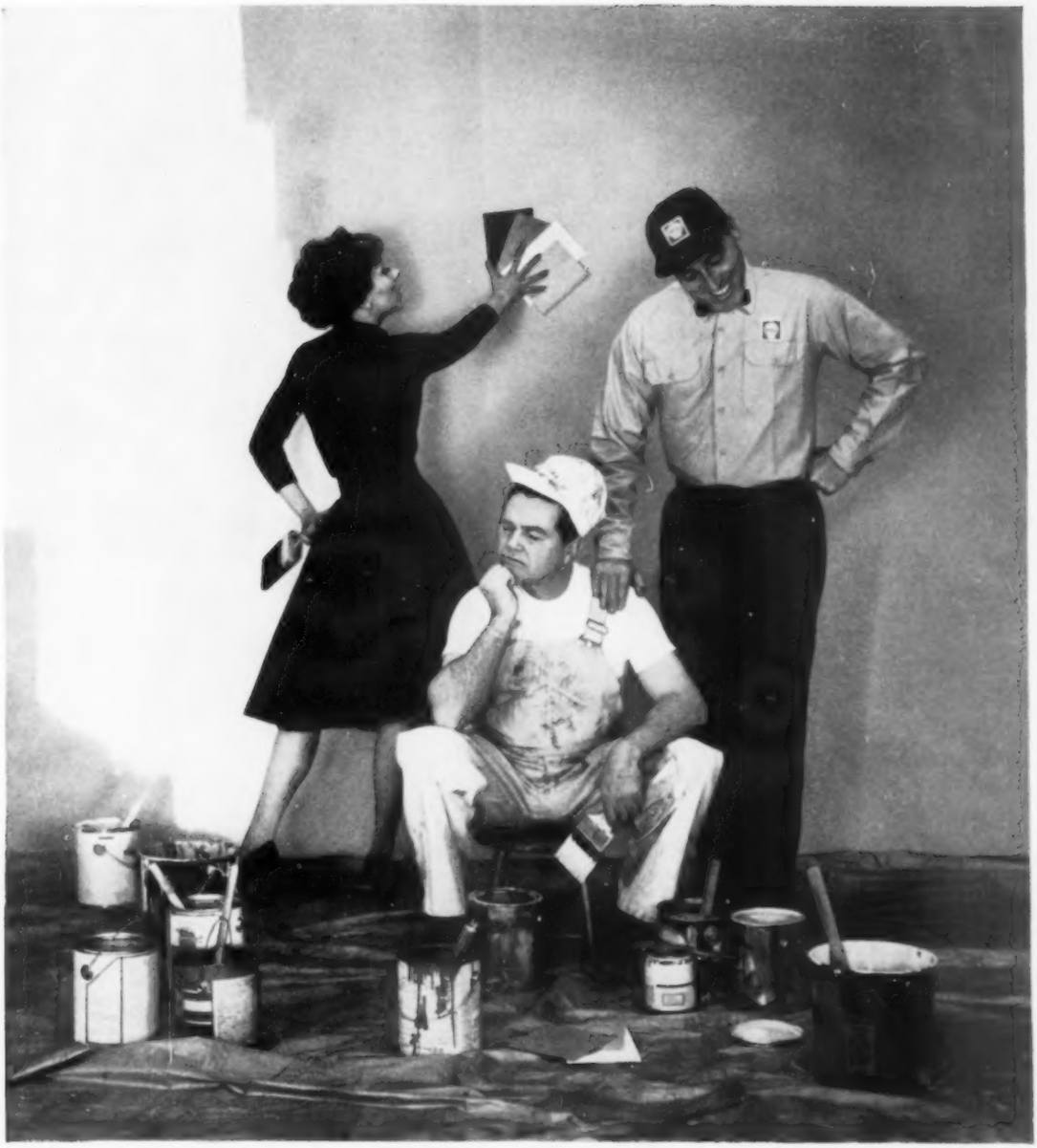

The oilman paints a "dream" house – When the lady finally makes up her mind, she can be sure her choice is a good one. Solvents from petroleum will give her the paint job she wants, and keep her new home beautiful for years and years to come. Long-lasting finishes for home and industrial use represent another achievement of petroleum research – and another note of thanks the consumer owes to you, the oilman. If you hear someone criticizing oil, you've good reason to speak up in return. The thousands of products derived from petroleum are proof that you've helped to make it one of the world's most versatile natural resources.

SHELL OIL COMPANY

CANADIAN NOTES

Canadian Oil Cos. Report

Sales and profits of Canadian Oil Cos., Ltd. this year are well ahead of 1960 according to president W. Harold Rea. Gallonage sales were up 5% to March 31st. Capital expenditures of the company are expected to total $10 million in 1961, a reduction of 10% from 1960. Funds for the capital program will be provided by the company through its operations and additional financing will not be required at this time.

Hees Discusses Expansion

A federal government cabinet minister re-affirmed that his government places high importance on "the continued orderly expansion" of Canada's oil and gas industry without mandatory controls.

Trade and Commerce Minister George Hees told members of the Canadian Petroleum Association that its National Oil Policy calling for 800,000 b/d production by 1963 will permit Canada's oil industry to enjoy the same percentage of production in relation to domestic demand as that prevailing in the U. S. at the present time—some 83%.

"The voluntary oil policy has been interpreted correctly as an expression of confidence in the ability of the industry itself to produce solutions to its own problems through creative leadership," Mr. Hees said.

"The policy embraces both widening the marketing area in Canada, to be supplied from domestic crude, and expanding exports to the U. S., particularly to the Puget Sound area."

Mr. Hees added that his government looks to integrated companies with refining capacity in Eastern Canada to contribute materially to this policy, it also expects all producers, especially those having affiliations with refiners in the U. S. to do their utmost to find additional crude market outlets.

"I can assure you, also, that we are determined to take all necessary steps to ensure that our policy for increasing oil production is carried out."

Mr. Hees was confident that with cooperation the objective can be carried out—without a rigid control system.

May Production Hits New High

May production of crude oil and natural gas liquids in Canada was projected for 645,000 b/d—an all-time high. Refiners' nominations for Alberta, Saskatchewan and demand figures from other provinces called for 634,500 b/d of crude and 11,000 b/d of natural gas liquids. Alberta's production allowable for May was set for 467,997 b/d, more than 35,000 b/d higher than in April. Ontario refineries were slated to take 229,000 b/d, with exports including 86,000 b/d to the Puget Sound area and 75,000 b/d to the U.S. Midwest.

Average daily production for the first seven months of 1961 is estimated at 610,000 b/d, up nearly 10% over the corresponding period last year.

LPG Demand to Double

Demand for butane and propane is expected to rise from the present 11,000 b/d to 24,000 b/d by 1970, delegates were told at the convention of Western Canadian District No. 12 of the Liquid Petroleum Gas Association in Calgary in April.

J. S. Sprague of Hu Harries and Associates, Petroleum consultants, indicated that while demand will double in ten years it is possible that production will increase to 70,000 b/d of LPGs by 1970.

Mr. Sprague pointed out that gas processing plants in Western Canada by the end of 1960 had LPG output capacity of 11,385 b/d of propane and 9,985 b/d of butane. Of the 16 gas plants under construction, three will install LPG extraction facilities to produce more than 14,000 b/d of propane and 12,000 b/d of butane.

D. Ross McRae, Vancouver, was elected president, succeding S. Pepper, Calgary.

Alberta Gas Has Rapid Growth

Net income for Alberta Gas Trunk Line Co., jumped 149% (correct) for the period ended December 31, 1960 compared with the same period in 1959, according to A. G. Bailey, president. AGTL experienced growth in all phases of its operations.

Operating revenue rose by 80%; expenses and taxes were up 38%; and interest and other expenses (net) were up 49%. Miles of pipe line in service increased 35% and gas throughput jumped by 71%.

Construction of the Foothills system, which is estimated to cost $85 million, is well underway. The Foothills division will feed the gas stream designed for export to California and Pacific Northwest markets. More than $16 million has been expended on this system by the end of 1960. During 1960, the company estimates it has spent $30 million on goods and services and anticipates an expenditure of $75 million in Canada in 1961.

Oil Import Reports Now Mandatory

All Canadian companies are required to report oil imports to the National Energy Board, according to a directive issued by the Federal Government late in April.

Gas Exports To Rise

Gas export from Canada, authorized at one billion cubic ft per day for 1962, should double by 1965, and double again by 1970 to average of four billion cubic ft per day. Forecast was made by C. H. Munro, manager of petroleum division for Canadian Bank of Commerce.

Wells Drop

Final count for March 1961 shows 201 well completions in western Canada, a reduction of 20% from 251 in 1960. First-quarter 1961 total of 579 wells was off 19% from 717 in 1960. Alberta fared worst; Saskatchewan best, was slight increase over 1960.

Home Records Solid Growth

An increase of 23% in gross income for the first quarter of 1961 was reported to the annual meeting of Home Oil Co. Ltd., April 27th, by R. A. Brown, Jr., president. Gross income (excluding non-recurring income items of $343,000) was $2,736,000 for the period compared with $2,229,000 in 1960.

Crude oil and natural gas liquids production for the first three months averaged 8,747 b/d compared with 8,110 b/d in 1960. Sales of natural gas averaged 42.3 mmcf/d, compared with 27.2 mmcf/d during the first quarter of 1960. Both income and production figures for 1960 include Redwater production which was sold in December for $7 million.

Brown said that while Home Oil welcomed the National Oil Policy, it did not regard it as an adequate substitute for either the Borden recommendation or the Montreal market. The Borden Commission, he pointed out, asserted that a level of production of 700,000 barrels of crude oil per day by the end of 1960 was required to sustain an oil industry adequate for Canadian national interest. The National Oil Policy target fell far short of that figure when it set an objective of an average of 625,000 barrels of crude oil and natural gas liquids per day by mid 1961. When natural gas liquids are deducted, it means that the National Oil Policy objective is 100,000 barrels of oil per day below the Borden Commission's target. Moreover, he said, he regarded the heavy reliance of the National Oil Policy on export markets being developed in the United States as much less satisfactory than the development of Canadian markets through the construction of a pipeline to Montreal.

A contract has been let to triple the capacity of the Carstairs gas processing plant to enable it to expand the throughput from the Carstairs field and process gas from Crossfield, he noted.

Use of Platinum Catalyst

General criteria for the effective use of platinum metals as catalysts in hydrogenations are reviewed in the current issue of Engelhard Industries Technical Bulletin, Vol. I, No. 3. The first article, "Hydrogenations with Platinum Metal Catalysts," outlines broad guideposts for researchers' selection of the most appropriate catalyst for specific hydrogenation reactions. These guides include: metals to be used, supports, solvents, temperatures and pressure, agitation, safety, concentration of catalysts and concentration of metal on carrier. Catalysts recommended for use in reduction of numerous functional groups also are included.

Copies may be obtained from the Technical Information Department, Engelhard Industries, Inc., 75 Austin Street, Newark 2, N. J.

New Heater Bulletin

Indirect-Fired Fintube Heaters are the subject of a new 8-page, 2-color bulletin published by Brown Fintube Co. These heaters are used to heat gases, steam and other vapors, heat transfer oil, Bunker "C" oil, asphalt and numerous other light and heavy liquids. General specifications and capacities are presented which include ability to obtain temperatures up to 1200°F, capacities up to 5 million Btu/hr and pressures up to 300 psig. Copies are available by writing for Bulletin 400, Brown Fintube Co., 300 Huron Street, Elyria, Ohio.

Centrifugal Compressors

A new 4-page brochure, "Centrifugal Separations for the HydroCarbon Processing Industry," Bulletin 2,800, issued by Dorr-Oliver Inc., Stamford, Conn., describes and lists specifications for Merco centrifuges, Mercone centrifugal screens, DorrClone separators and Dorr-Oliver DSM screens designed for use in the chemical and petrochemical processing industries.

NEW PUBLICATIONS

"Chapter 1, Introduction, of the Guide for Inspection of Refinery Equipment," is available from the American Petroleum Institute. This first edition, 1961, covers the history, philosophy, and contents of the guide, which consists of a total of 20 chapters. The chapter also contains information on the qualifications and functions of an inspector. Order from the Publications Department, American Petroleum Institute, 1271 Avenue of the Americas, New York 20, New York. Price, 50 cents a copy.

The American Petroleum Institute's Division of Production announces the availability of four new publications.

"Well Testing" is a 48-page illustrated handbook designed for operating personnel. It may be ordered at a cost of $2.50 ($3.00 foreign) a copy.

"Model Form of Unit Agreement," Second Edition, 1961 and *"Model Form of Unit Operating Agreement,"* Second Edition, 1961 are companion publications. Cost is 75 cents a copy.

"Standard Procedure for Presenting Performance Data on Hydraulic Fracturing Equipment," API RP 41 provides a standard for measuring, reporting and certifying the hydraulic-horsepower rating of pumping units used in fracturing service. The price is 50 cents a copy.

Copies may be ordered from the Division of Production, American Petroleum Institute, 300 Corrigan Tower Building, Dallas 1, Texas.

The American Petroleum Institute has announced the availability of Chapter V, *"Preparation of Equipment for Safe Entry and Work, of the Guide for Inspection of Refinery Equipment."* This is the First Edition, 1961. It covers the preparatory work, inspections and tests which should be undertaken to assure that equipment has been properly cleaned and gas-freed and is safe for opening, entry, and work. Orders should be directed to the Institute Publications Department, 1271 Avenue of the Americas, New York 20, N. Y. Price is 75¢ per copy.

"Standard for Field Welding of Pipe Lines," 7th edition of API Std. 1104, March 1961, has been published by The Division of Transportation of the American Petroleum Institute.

It contains two major changes which are related and were adopted so that one size die and plunger could be used for all guided bend tests, regardless of type or thickness of material being tested. A number of editorial corrections also have been included. Copies may be purchased from the Publications Section, American Petroleum Institute, 1271 Avenue of the Americas, New York 20, N. Y., price 50¢ per copy.

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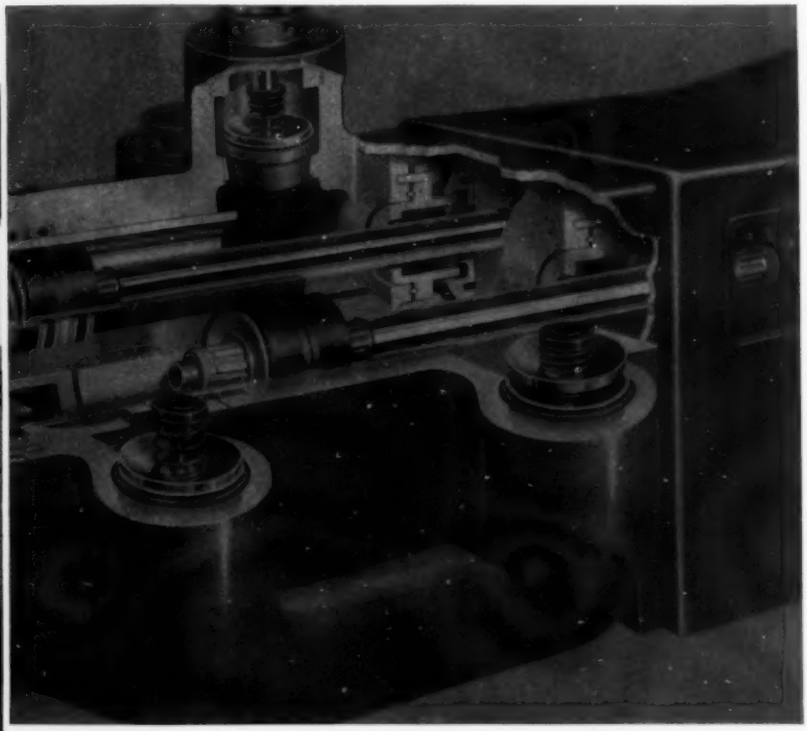

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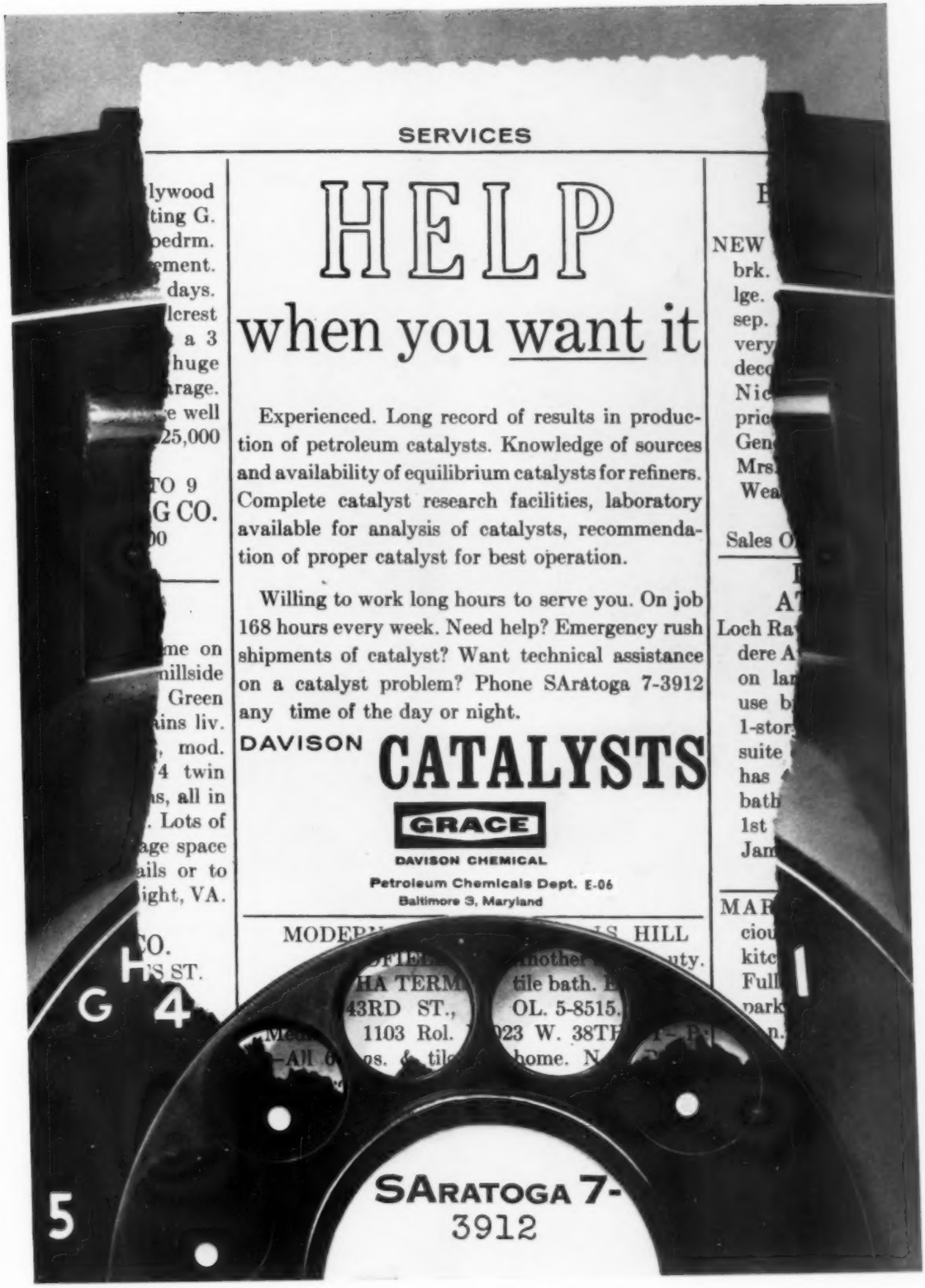
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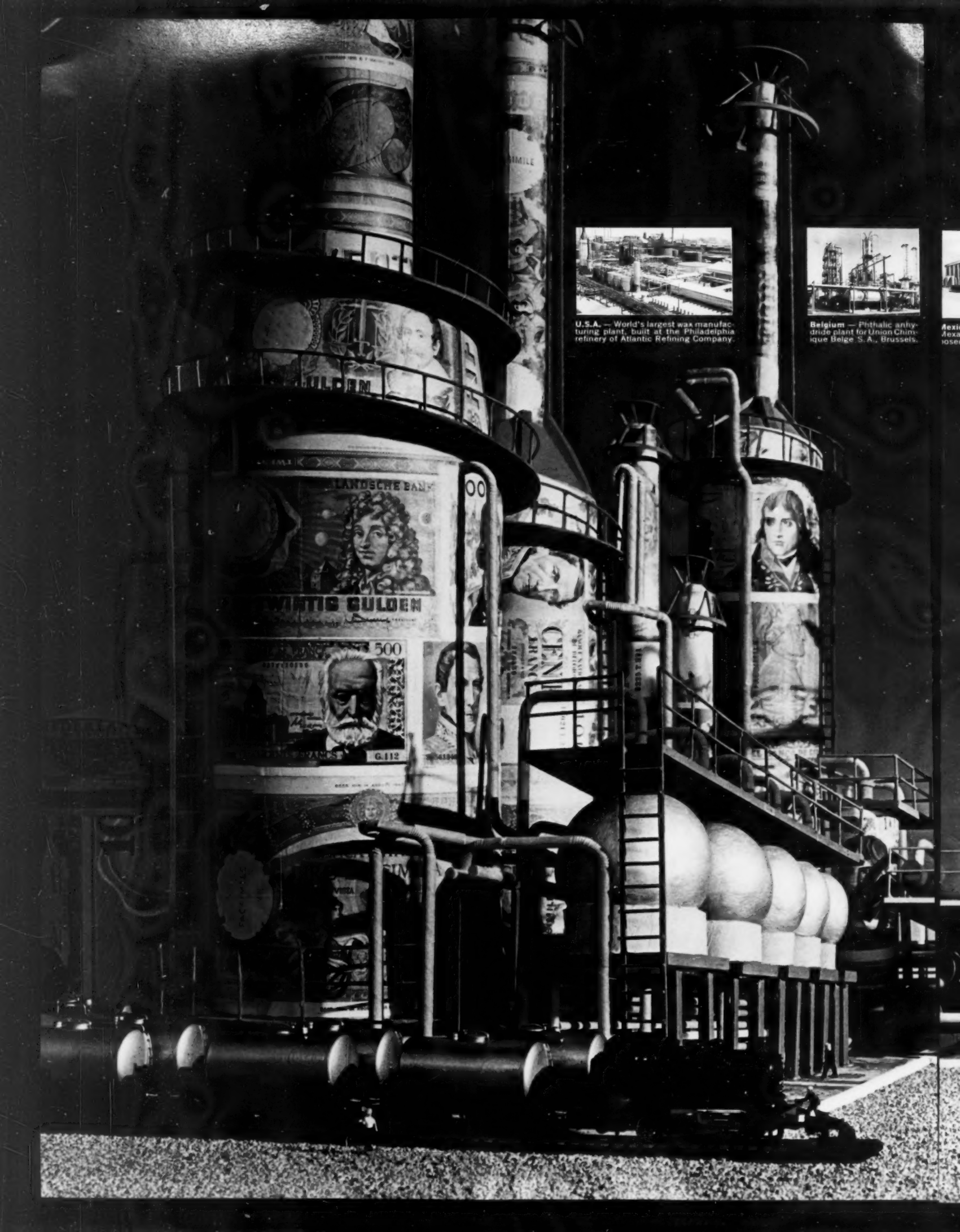
U.S.A. — World's largest wax manufacturing plant, built at the Philadelphia refinery of Atlantic Refining Company.
Belgium — Phthalic anhydride plant for Union Chimique Belge S.A., Brussels.
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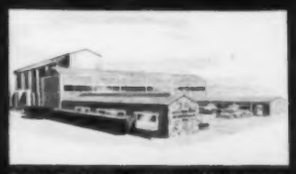

Mexico — Citric acid plant for Quimica Hexama S.A. Drawing includes proposed future expansion.

Holland — Complete 100,000 bpsd "grass roots" refinery constructed for Esso Nederland in the vicinity of Rotterdam.

Taiwan — 600 bpsd sulfuric acid alkylation plant for Chinese Petroleum Corp., Kaohsiung.

Spain — Fractionation unit for Empresa Nacional Calvo Sotelo.

Italy — 10,000 metric ton year phthalic anhydride plant recently completed for ACNA in Cengio.

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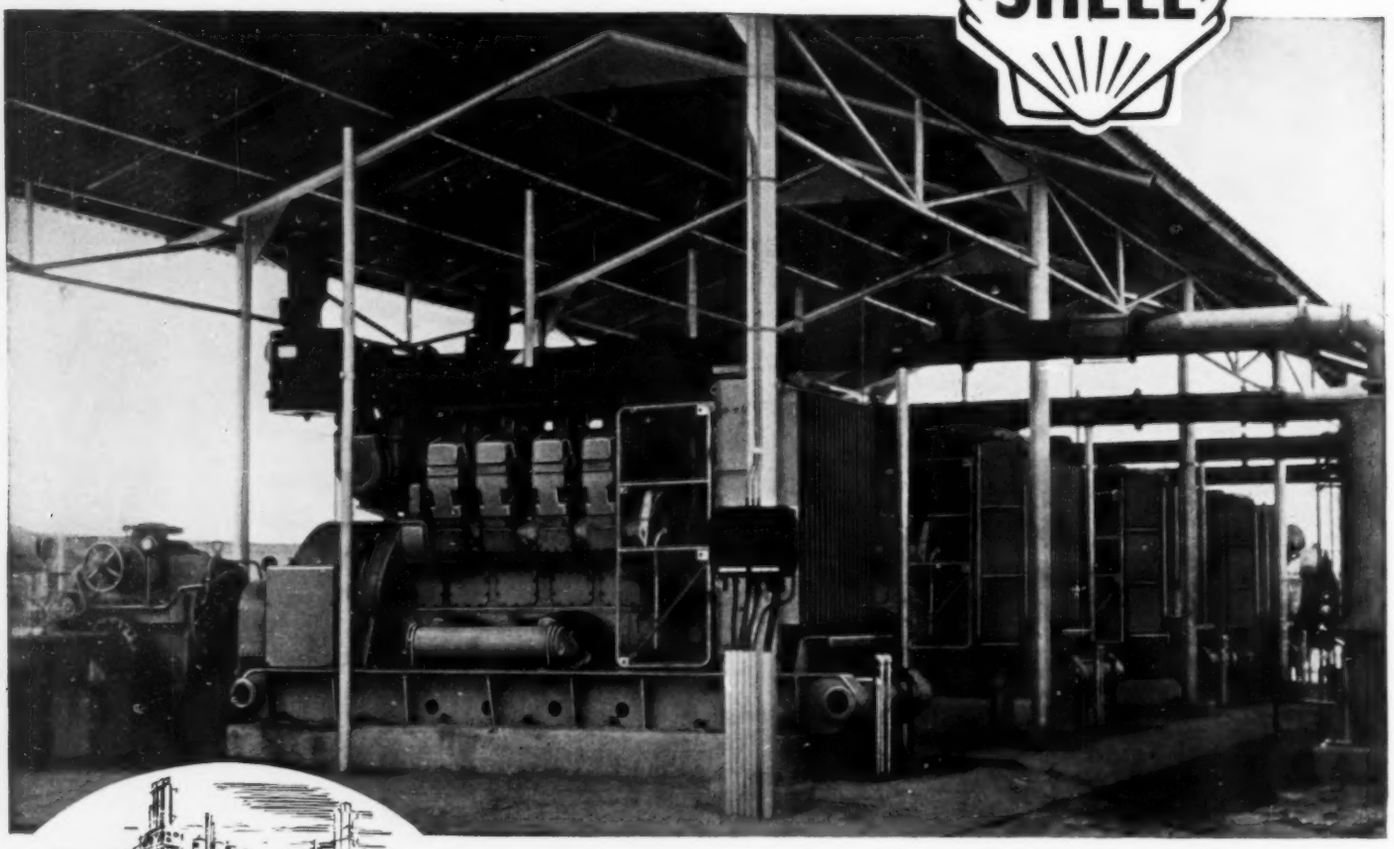

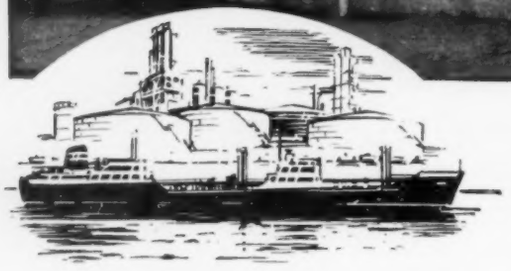

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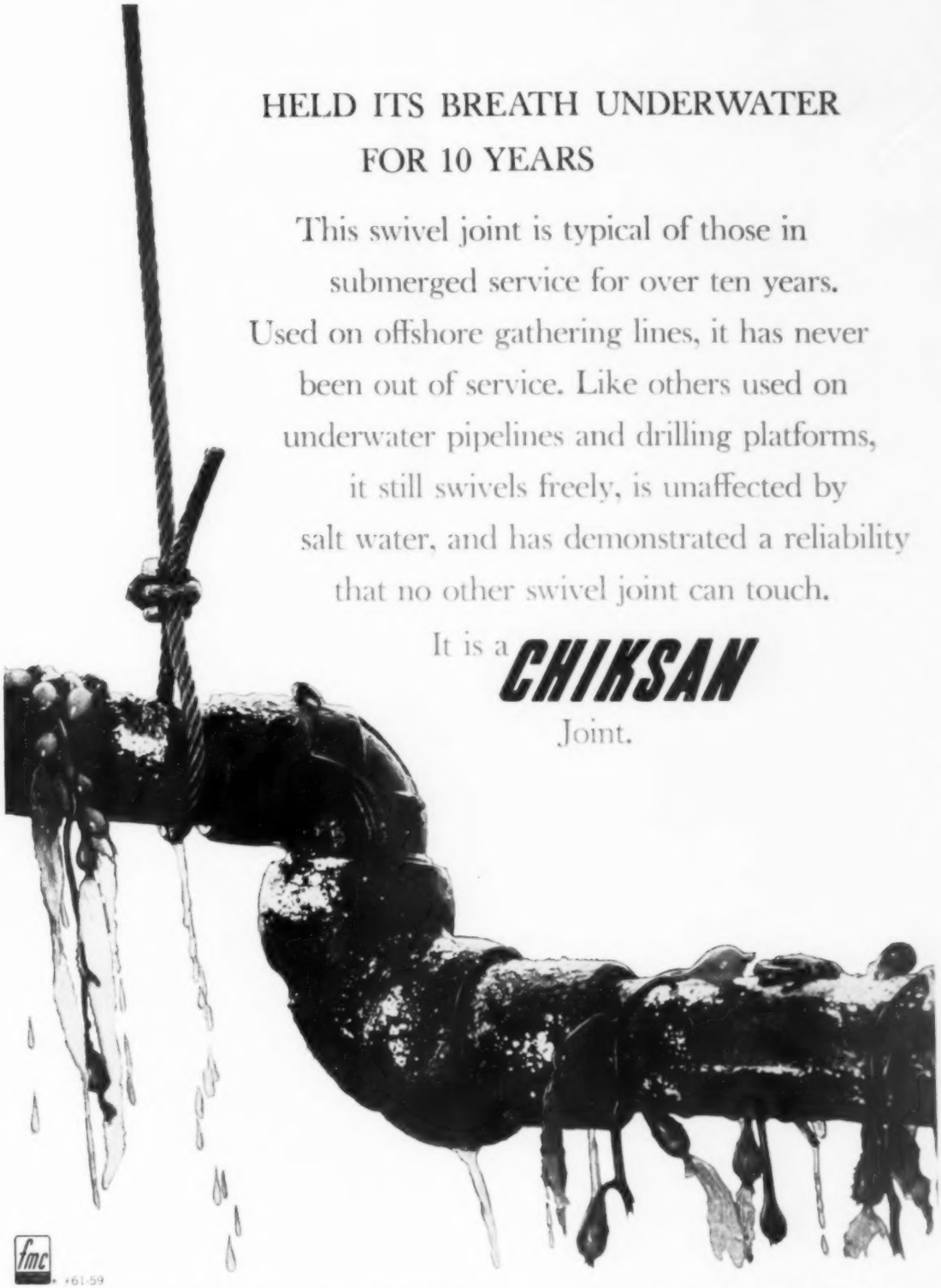

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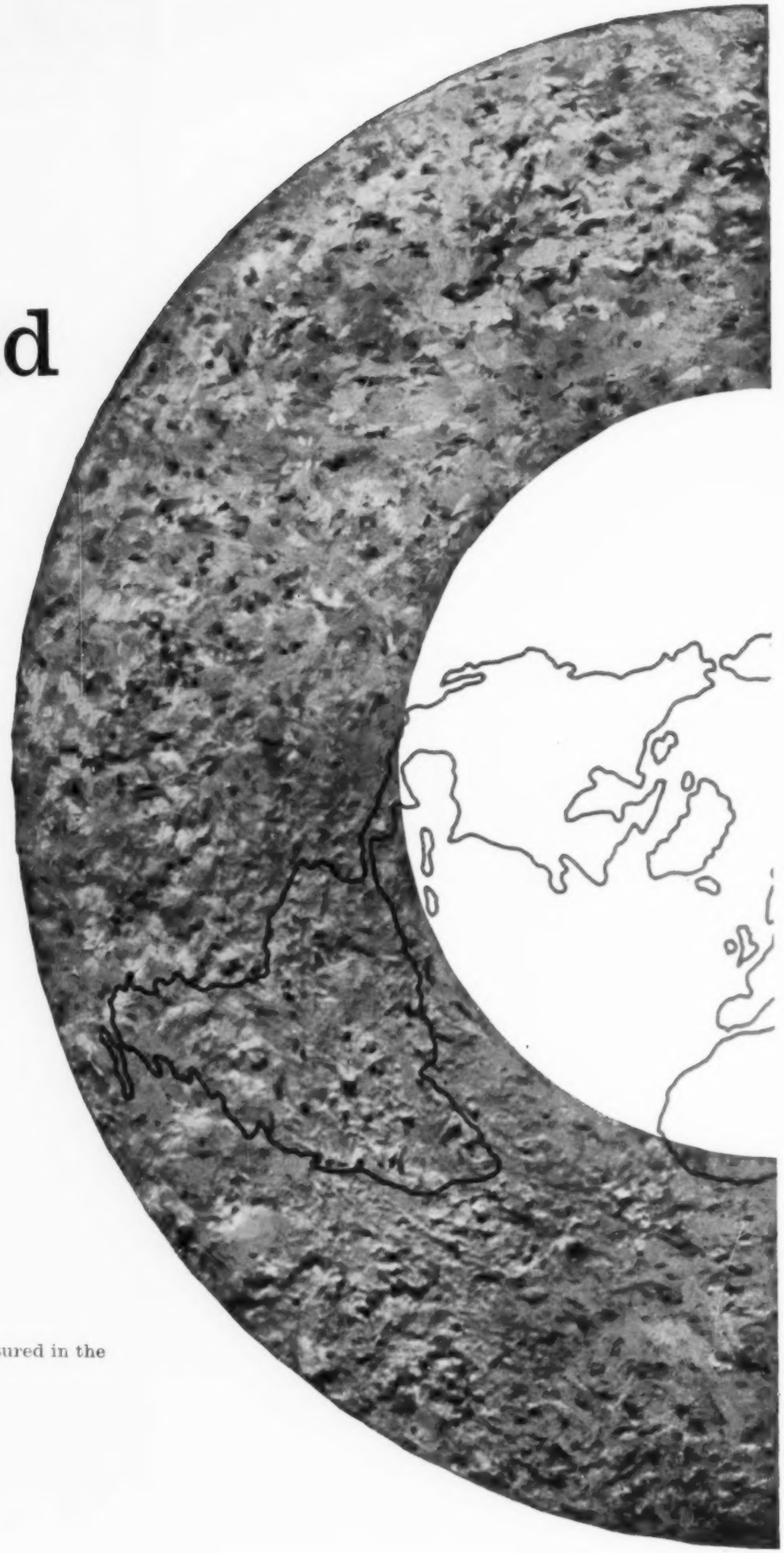

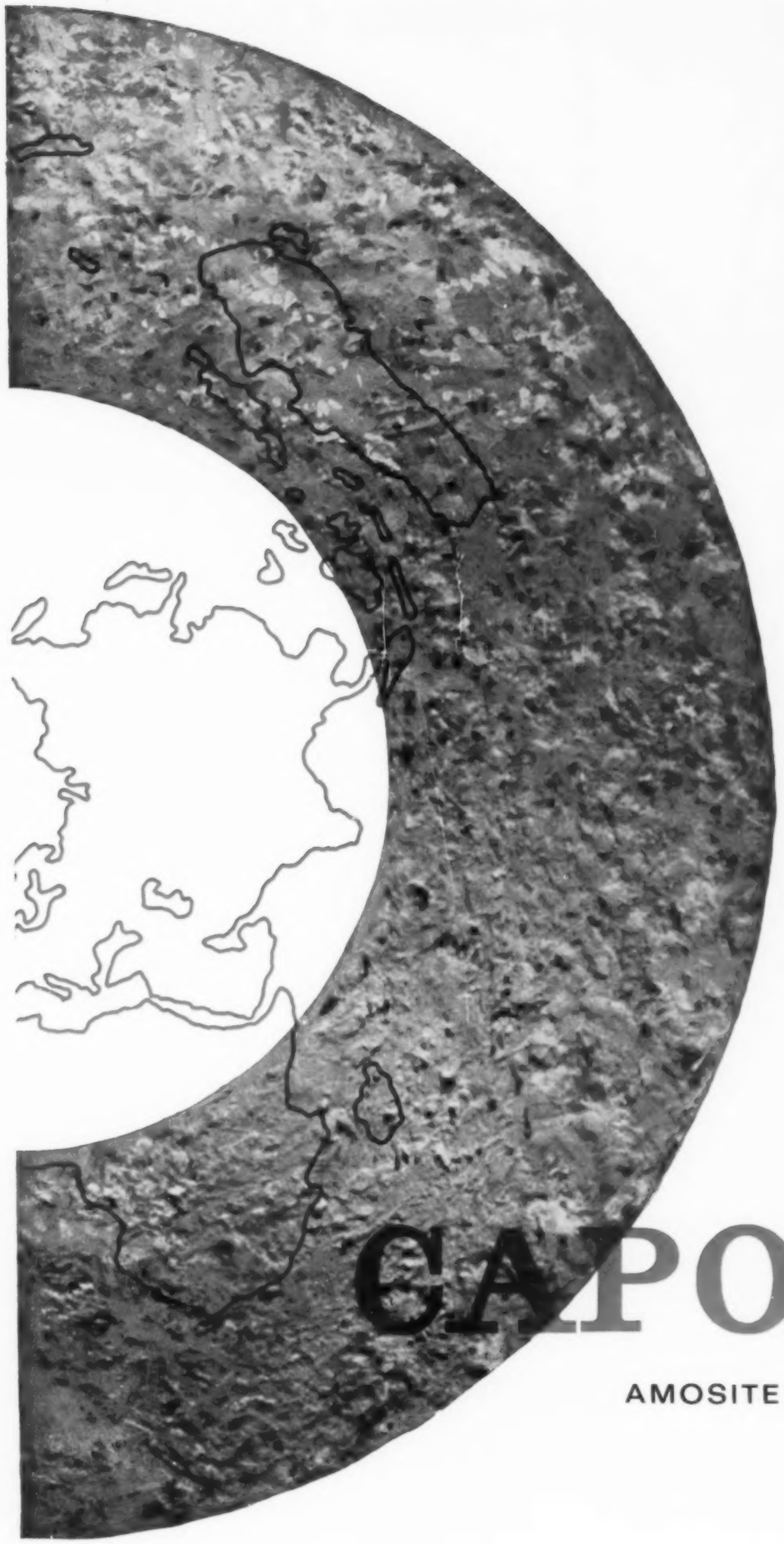

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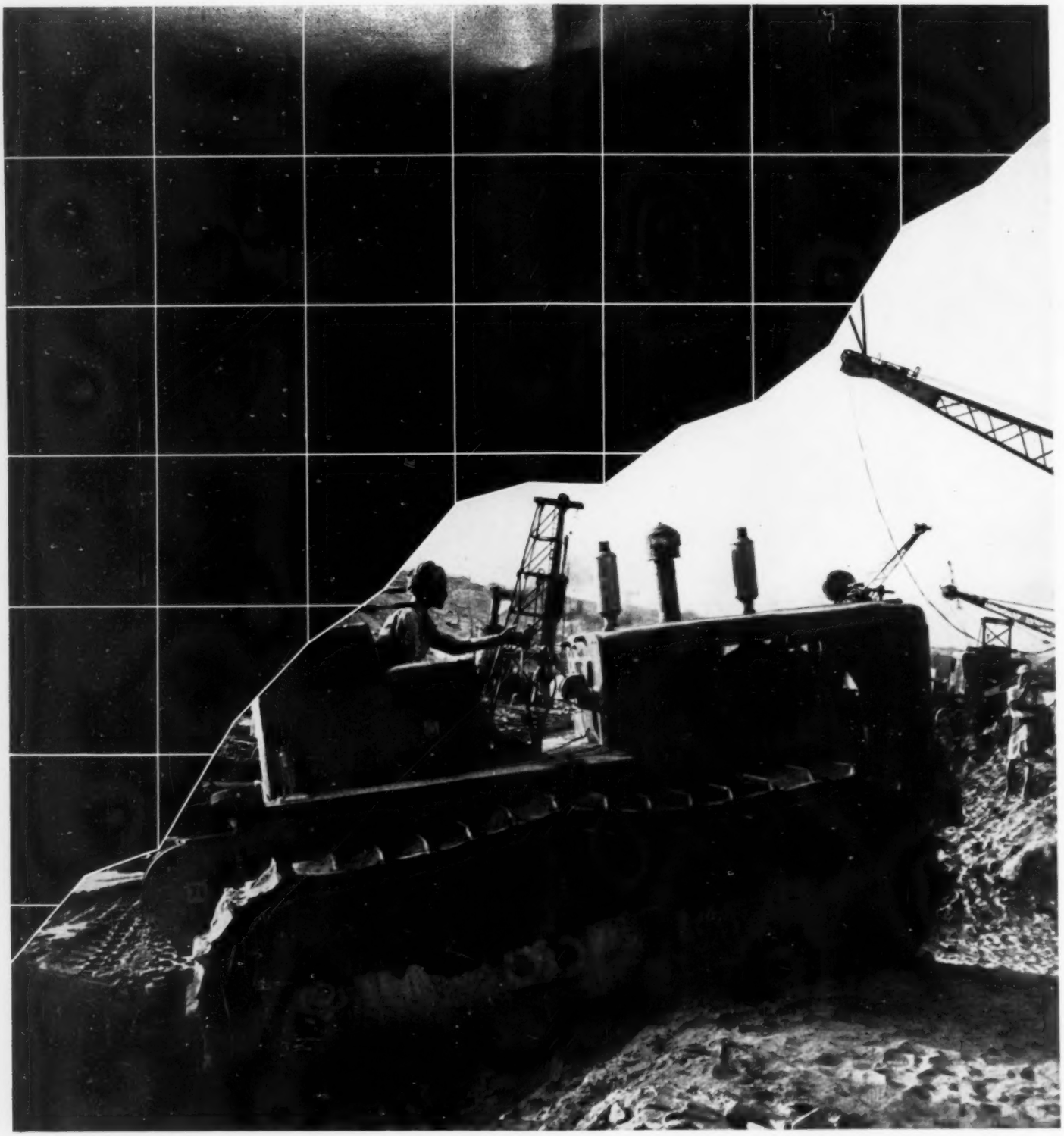

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WHERE RESEARCH TODAY MEANS PROGRESS TOMORROW

by William C. Uhl
Processing Editor

Highlights of the month—improvements in steam methane reforming to produce hydrogen, molecular sieves for hydrogen production, wax crystal modifiers improve process economics, a realistic look at computer control of process units.

Significant improvements in steam methane reforming—the most widely used method of producing hydrogen—are being watched keenly by the industry. These improvements have made possible reductions in the initial cost as well as operating expenses of such facilities, according to M. R. Kitzen, Selas Corp. of America, and Jack Tielrooy, a consulting engineer, in a paper presented at the New Orleans meeting of the American Institute of Chemical Engineers earlier this year.

The continually growing use of hydrogen—for upgrading conventional products as well as for petrochemicals—has caused refiners to pay increasing attention to techniques for producing supplemental hydrogen above and beyond that obtained as a by-product of catalytic reforming.

Present estimates place the total USA consumption of hydrogen at more than one trillion cfd by 1965. A large part of this usage is accounted for by synthetic ammonia and synthetic methanol manufacture, but hydrogen processing in the refinery is also an important use. Meanwhile, other uses continue to grow. Among them are reduction of metallic ores, production of Oxo process aldehydes and alcohols, hydrogenation of fats and oils and of organic intermediates, and possible production of liquid hydrogen as a high energy rocket fuel.

The cost reductions mentioned in the AIChE paper have been achieved by operating at higher pressures and by operating the reforming furnaces with higher heat flux densities, higher space velocities, and higher tubeskin temperatures. Such improvements have in turn been made possible by the development of improved catalysts, better tube metallurgy and furnace design, particularly techniques for controlling heat distribution, the authors said.

As recently as eight years ago, steam methane reforming was carried out at essentially atmospheric pressure, the paper pointed out. Even though the reactions are favored by low pressure, there are significant economic advantages to operation at elevated pressures. First is the gas compression power which is saved; and since the hydrogen is normally used at higher pressures, the cost of gas compressors is also substantially reduced. Even more important is the overall thermal efficiency which can be attained. At pressures above 100 psig, most of the latent heat in the excess process steam can be recovered at a useful level and used to reboiler the carbon dioxide removal system. In many plants, the heat recovered from the process gas after shift conversion is sufficient to supply the total heat requirements of a monoethanol amine system for CO_2 removal.

Another approach to producing hydrogen economically is the possibility of using molecular sieves, as suggested in another AIChE paper, by C. J. Griesmer and J. J. Collins of Linde Co.

Adsorption techniques with molecular sieves have already been applied rather widely in downstream processing since the materials first reached the market in 1954. As now used commercially, most refining applications have been primarily to provide drier and purer feed and products.

As a means of supplying bulk hydrogen, the Linde Co. authors said the molecular sieves promise to be economically attractive. They might typically be used in obtaining hydrogen from steam reformed natural gas (hydrogen production), catalytic reformer off-gas (hydrogen up-grading), and demethanizer overhead (hydrogen recovery).

A comparison of the relative economics based on preliminary cost estimates was worked out by the authors using a constant hydrogen-product-flow basis of 20 mmcf/d. Capital investment ranges from $750,000 to $1.5 million, and operating cost from 1.4 to 3.9¢ per 1000 SCF of product. See Table 1.

Wax crystal modifiers can play an important economic role in dewaxing processes, it was reported in a paper presented by H. E. Deen, N. R. Roux, and K. R. Costikyan of Enjay at the Western Petroleum Refiners' Association meeting in San Antonio in April.

Additives such as these have for many years been used as pour depressants for lube oils. More recently, however, they've been applied to the process itself—as dewaxing aids, improving the economics of one the most expensive steps in lube oil processing.

The method of action involved suggests why wax crystal modifiers are useful. Through a probable co-crystallization mechanism, they help to promote the growth of wax crystals that have a uniform, well-defined structure. This produces, in filtration, a compact cake of good rigidity and high permeability. In terms of process efficiency, this can mean improvement in one or more of the following ways: (1) increased filtration rates, (2) higher dewaxed oil yields, (3) lower oil content of the waxes, and (4) lower solvent dilution ratios.

In one example cited in the paper, a company had difficulty filtering a phenol-treated, 90 Neutral, 72 V.I. waxy distillate in its MEK plant. It was found that a treat with dewaxing additive at 10¢ per bbl reduced filtering time, raised the oil yield some 3%, and reduced solvent requirements by 60%.

In another company, it was desired to improve product yield and quality in the MEK dewaxing of 600 Neutral oil. Filter capacity was no problem. A 10¢ per bbl treat of dewaxing aid gave a 30% reduction in oil content of the wax, with oil yield increasing by more than 8%. This resulted in over $1400 per day increased profit, and the melting point of the wax was also raised significantly.

Further examples were reported in the paper for cases ranging from MEK to propane to plate & frame dewaxing methods, and providing increases in throughput, in oil yield, and improvements in wax quality.

A realistic look at computer control was provided in the conclusions of another WPRA paper, presented by H. M. Hart, R. T. O'Neil and J. C. Rhodes of American Oil Co., Whiting, Indiana.

American's work in this field, which started some three years ago, has been carried out jointly with International Business Machines Corp. A detailed report on some of the more significant results appeared in WORLD PETROLEUM, December, 1960, pp. 68-75, in the article "Electronic Computer Monitors World's Largest Crude Still," which described the application of computers to American's 140,000 b/d unit at its Whiting refinery. By computer control is meant the use of on-line digital computers to continually evaluate and optimize selected process operations.

American feels today that computer control should be viewed as a long-range development with the usual development risks. Costs are high, and not the least cost is that of the technical manpower needed for model building and program development.

As a result, only the very largest process units are attractive as candidates. And even among large units, it is foolish to rush into second and third applications for a given process until the first development is well worked out. When that time comes, program development costs for successive applications can certainly be expected to drop. System hardware will also become less necessary to the growth of applications more widely.

A vital initial phase of most applications of the computer to catalytic processes is a study of reaction variables and their effect on yield.

"Better yields through newly acquired knowledge and through closer monitoring and control are the best hope for really handsome payoffs from excursion into computer control," the authors said. "Much of the new knowledge gained from one such installation can probably be applied widely to sister units without computers, so that second and third installations for given processes will be much harder to justify."

• • •

What's New in Processing Plants

Completion dates set—for India's two public sector refineries: the $38 million, 20,000 b/d plant at Gauhati, Assam, by end-1961; the $88 million, 50,000 b/d plant at Barauni, first phase by Sept. 1962, second phase March, 1963, and balance Sept., 1963, including a lube oil plant. Also planned at Barauni, a 20,000 ton/yr LPG facility.

• • •

Planned—a $15 million refinery at San Lorenzo, Argentina, with completion in 1963, by Hydrocarbon Argentina, S. A. (50-50 ownership by Minera Alu-

(Continued on page 32)

Table 1—Preliminary Economics of Molecular Sieve Process for Supplying Bulk Hydrogen
(Product flow @ 20 mmscf/d)

	Steam reformed nat'l gas	Catalytic refm. hydrogen		Demethanizer overhead	
Crude H_2 feed, mmscf/d	26	39	31	33	26
Product H_2 purity, mol%	98.8	95	95	95	95
H_2 recovery, %	92	75	95	75	95
Installed plant cost, battery limits, $1000	1,500	750	1,000	700	900
Operating cost, excl. value of feed, ¢/mscf	3.9	1.5	2.0	1.4	1.8

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New Synthetic Rubbers

Pioneering of a new isoprene process by SD in collaboration with the Goodyear Tire & Rubber Co. resulted in the only isoprene plant under construction for a major rubber company. The new complex also includes plants for polyisoprene (synthetic natural rubber) and polybutadiene.

New Synthetic Fibers

The SD Group developed the least expensive and most efficient means of making (1) ethylene glycol and terephthalic acid for the new durable polyester synthetic fibers and (2) caprolactam and adipic acid for synthetic fibers of nylon-6 and nylon-66 type.

Plastics and Paints

Polyvinyl chloride—Development of lower cost plants by SD permitted independent producers to manufacture this most versatile material very economically. Polyvinyl chloride plants utilizing the technology developed by SD now account for one-third of U. S. production. This was a factor in a great expansion in the markets for PVC.

Polyethylene—SD is designing and constructing one of the simplest and most economical polyethylene plants using a new process.

Glass Reinforced Plastics—SD pioneered in the development of some basic intermediates, such as maleic anhydride and phthalic anhydride for the resins used in making boats, aircraft and missiles, appliances, building materials, etc. SD-designed maleic anhydride plants now account for two-thirds of the world's capacity, and its new ortho-xylene phthalic catalyst has changed the whole industry's raw materials position.

Resins—SD recently announced a direct oxidation process for phenol, the basic ingredient of the phenolic resins used in molding compounds, decorative materials, coatings and insulation.

Dry Cleaning Compounds (solvents)

Research on chlorinated hydrocarbons led to the most efficient process for the production of perchloroethylene, the most widely used cleaning solvent for home and industry. Similar techniques went into new processes for manufacturing refrigerants, aerosol dispersants and similar products.

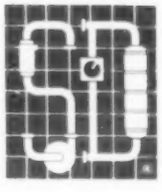
Foods

SD has developed processes for production of (1) citric acid (with Noury and van der Lande in Holland), an ingredient in bottled soft drinks, jams, preserves and candies and (2) intermediates for glycerine, which is used in foods, candies, beverages as well as drugs and pharmaceuticals.

Permanent-Type Antifreeze and Liquid Detergents

SD's ethylene oxide-ethylene glycol process accounts for one-third of world's capacity—these compounds are the base for all permanent-type antifreezes, and for the intermediate used in most of the newer household liquid detergents.

AND MANY MORE MAJOR PROCESSES ARE BEING DEVELOPED BY SD



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SD 166

Processing Review

(Continued from page 28)

mine of Buenos Aires and Hydrocarbon Research Inc. of New York), to produce 8,000 to 11,000 b/d of high octane gasoline and 700 b/d benzene, using new thermal (non-catalytic) hydrodealkylation process developed by HRI and Atlantic Refining Co. and a new HRI extraction process for the aromatics, to operate on 12,000 b/d naphtha feedstock from YPF facilities at San Lorenzo and Campo Duran.

• • •

Planned—expansion of Syriam, Burma, refinery by Burmah Oil Co. (1954) Ltd., to about 13,000 b/d capacity, by early 1963.

• • •

Under construction—new 20,000 b/d crude still, supplied by USSR, at Soc. Egyptienne pour la Raffinage's 6,000 b/d plant near Alexandria, Egypt, which will raise capacity to 26,000 b/d by end-1961.

• • •

Expansions and new refineries—authorized in Italy by the Inter-Ministerial Commission on Oil Production:

(1) A new 60,000 b/d refinery in northern Italy by the Edison group, to be linked by pipeline to Genoa.

(2) A new 40,000 b/d refinery in the Po Valley by ANIC, a member of the ENI group.

(3) A new 20,000 b/d refinery in Sardinia by Soc. Mediterranea Petroli.

(4) A new 20,000 b/d refinery at Civitavecchia by Soc. Clasa.

(5) Expansion of the Rho (near Milan) refinery of Condor SpA (Shell group member), from present 34,000 b/d up to 80,000 b/d.

(6) Expansion of the La Spezia refinery of INPET (also Shell group member) from present 40,000 b/d up to 80,000 b/d.

(7) Expansion of the Genoa-San Quirico refinery of Soc. Garrone, from present 35,000 b/d up to 80,000 b/d.

(8) Expansion of the Rome refinery of Purfina from present 11,000 b/d up to 30,000 b/d.

(9) Expansion of the Genoa refinery of Purfina from present 11,000 b/d up to 11,400 b/d.

• • •

Contract signed—by French company ENSA, to build an 11,000 b/d refinery at undisclosed site in the Dominican Republic.

• • •

Being considered—a new 10,000 ton/yr lube oil plant on India's west coast, by Indian Government, possibly in place of a plant at Barauni refinery. Among company proposals is one by Italy's ENI. Plant would be in addition to that proposed by StanVac (in which they would take in government as 50% partner).

• • •

Planned—a new 40,000 b/d, $50 million refinery, in Frankfurt, Germany, area, by Caltex, with completion expected by end of 1963. Caltex and Farbwerke Hoechst have signed long term agreement on supply of petrochemicals from refinery.

• • •

Approved—by Spanish government, proposal of Ohio Oil Co. and Spanish associates to build an $18 million 25,000 b/d refinery on North Atlantic coast. Site has not yet been selected. Completion date: mid-1964. Crude will come from Libya. Ohio Oil will bear 84% of cost of construction. Final ownership, as established in terms of permission grant by government, will be: Spanish Government, 52%; Ohio, 28%; its Spanish associates, 16%; and Cia. Iberica de Petroleos S. A., 4%.

• • •

Accepted—bid by Indiana Standard, to purchase 25,000 b/d Cremona, Italy, refinery of Raffineria Italiana Olii Mineralii, plus some 700 service stations. Decision was by Milan Tribunal, and Indiana Standard's affiliate, Amoco International, will acquire properties for $14.5 million. Amoco Italia will be operating company.

• • •

Under construction—a $5 million, 7,500 b/d Isocracking unit, at Toledo, Ohio, by Standard Oil Co. (Ohio), under license by California Research Corp. Ralph M. Parsons Co. is contractor, and completion is expected in November.

• • •

Planned—a 40,000 b/d refinery, plus a 10,000 ton/yr polyethylene plant, at Burgas, on Bulgaria's Black Sea coast, to be built by Russians, with completion expected in mid-1963.

Contract awarded—for a 5,000 b/d fluid catalytic cracking unit, at Superior, Wisc., by Murphy Oil Corp. to Southwestern Engineering Co. Completion, Dec. 1, 1961.

• • •

Under consideration—a $14 million refinery in Rhodesia, to be built by American Independent Oil Co. Government has granted Aminco an extension of its option.

• • •

Contract awarded—to Arthur G. McKee Co. by Golden Eagle Refining Co. of Panama, for construction of its planned 60,000 b/d refinery and petrochemical facilities at Portobelo, Panama. Completion target November, 1962. Golden Eagle, a subsidiary of Ultramar Ltd. says sales contracts for products have been signed covering production for 17 years. Crude oil will come from Colombia, Venezuela, and Saudi Arabia.

• • •

What's New in Petrochemicals

Contract awarded—for engineering a 285 ton/day ammonium nitrate plant, at Pernis, Netherlands, by MEKOG, to Soc. Belge de l'Azote et des Produits Chimiques du Marly (SBA).

• • •

Agreement reached—by Burmah Shell and government-owned Fertilizer Corp. of India, by which Shell will supply gas for production of about 350,000 ton/yr of fertilizers, for ten-year period.

• • •

Planned—50,000 ton/yr ammonia plant, adjacent Esso's Milford Haven, England, refinery, by newly formed joint company (50-50 Esso Petroleum Ltd. and Fisons Ltd.). Both Esso's facility and a separate but connected nitrogen products plant to be built by Fisons are to be onstream spring of 1964.

• • •

Completed—new Chemico (Chemical Construction Co.) high pressure gas reforming furnace (250 psig), for synthesis gas production, at Toulouse, France, ammonia plant of Office National Industriel de l'Azote.

• • •

Contract awarded—to Scientific Design Co. Inc., by Bombrini Parodi-Delfino SpA, for a 10 million lb/yr maleic anhydride plant at Colleferro, Italy. Completion date, mid-1962.

• • •

Planned—60,000 ton/yr ammonia plant, by W. R. Grace & Co., at Big Springs, Texas, adjoining Cosden Petroleum Corp. refinery and to be operated by Cosden. Completion early 1962. Contractor, Foster Wheeler Corp.

• • •

Planned—50 million lb/yr acetylene plant at Montague, Mich., by du Pont (first for the company; it has been buying $20 million/yr of acetylene), using new process reportedly a modification of Huels electric arc technique to make the material from natural gas and oil. Completion date, early 1963.

• • •

Completed—7,000 ton/year detergent alkylate unit at Shell Oil's Geelong, Victoria, Australia, refinery.

• • •

Contract awarded—for $12 million specialty rubber plant at Strasbourg, France, by Polymer Corp. Ltd. to Badger Mfg. Co.

• • •

Planned—a new alkyl lead compounds facility (an estimated 26 million lb/yr of lead converted to alkyls) in the Gulf Coast area, by Nalco Chemical Co., making five firms now engaged in or planning to start production of TEL and TML compounds. Others are Ethyl, du Pont, Houston Chemical, and Stepan Chemical.

• • •

Order placed—by Maschinimport, Bucharest, the Romanian state enterprise for foreign trade, with Petrocarbon Developments Ltd. of the United Kingdom, for a polystyrene plant, valued in excess of $2.25 million (including fees for know-how and engineering services). Location and capacity has not been disclosed. The monostyrene feedstock will be produced locally in a plant to be designed and constructed by Romanian engineers.

• • •

Completed—a $2.8 million carbon black plant near Port Elizabeth, South Africa, with initial output of 10,000 ton/yr, by jointly-formed group composed of Phillips Petroleum Co. and the government-owned Industrial Development Corp.

Planned—expansion of polyethylene production capacity at Fawley, England, by Monsanto Chemicals Ltd., from present 17,000 ton/yr by about 50%. Completion early 1963.

• • •

Under construction—new $12 million, 30,000 ton/yr butyl rubber plant at Fawley, England, by Esso Petroleum Ltd. Completion date, end-1962. Contractor is Foster Wheeler Ltd.

• • •

Completed—1 million gal/yr lube oil additives plant, at Mexico City, by Oronite Division, California Chemical Co., operated by Cara Molina-Font.

• • •

Planned—62,000 ton/yr $10 million ammonium nitrate plant, at undisclosed site in Peru, by Corporacion de Reconstruccion y Fomento.

• • •

Completed—expansion of styrene monomer facilities at Sao Paulo, Brazil, by Cia. Brasileira de Estireno, to more than double original capacity.

• • •

Under construction—1,200 ton/yr phthalic anhydride plant in the Netherlands, by Alchemica N. V., a subsidiary of Archer-Daniels-Midland Co. Completion, early in 1962.

• • •

Planned—a $96 million petrochemical complex, in Aruba, by Aruba Chemical Industries, N. V. An earlier report (in WORLD PETROLEUM, February, 1961, and other journals) that the facility was planned by Lago Oil & Transport Co., was in error.

• • •

Planned—a 90,000 ton/yr fertilizer plant, near Bombay, India, by Indian government, at cost of $30 million. Chemical Construction Co. has contract.

• • •

Completed—6 million lb/yr maleic anhydride plant, at Montreal, Que., by Monsanto Canada Ltd.

• • •

Under construction—a polystyrene plant with ultimate capacity of 16,000 ton/yr, at Leghorn, Italy, by Dow Chemical International Ltd. S. A. Initial production is anticipated in 1962. Foster Wheeler is contractor. Operator will be Dow Chimica Italiana, SpA, of Milan.

• • •

Contract awarded—for steam cracking plant at Stenungsrund, Sweden, petrochemical complex being built by Svenska Esso, to Fluor Corp. Ltd. Completion date is July 1, 1963.

• • •

Planned—a 5,000 ton/yr high pressure process polyethylene plant, at undisclosed site in Pakistan, by Manzoor Chemicals Co. and General Industries Ltd. German group has contract; Salzgitter Industriebau GmbH and Braunschweigische Maschinenanstalt.

• • •

For additional news about new plants in the United Kingdom, see the London Letter in this issue.

• • •

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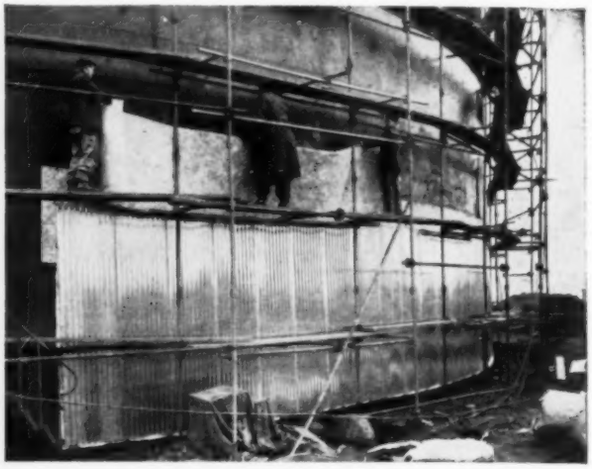

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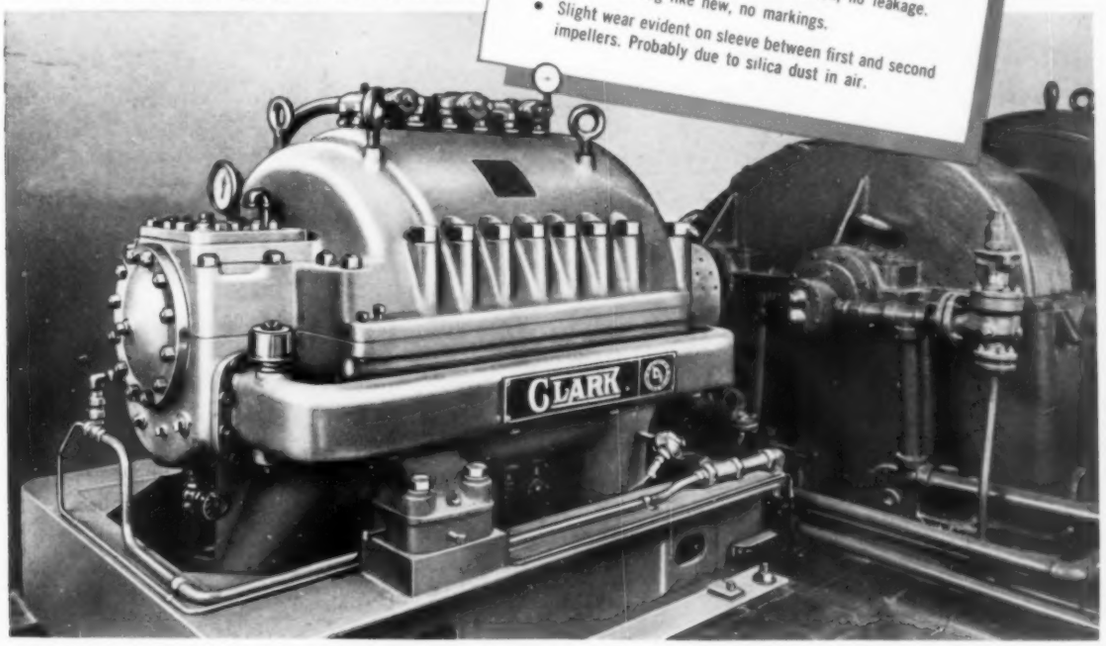
SERVICE REPORT

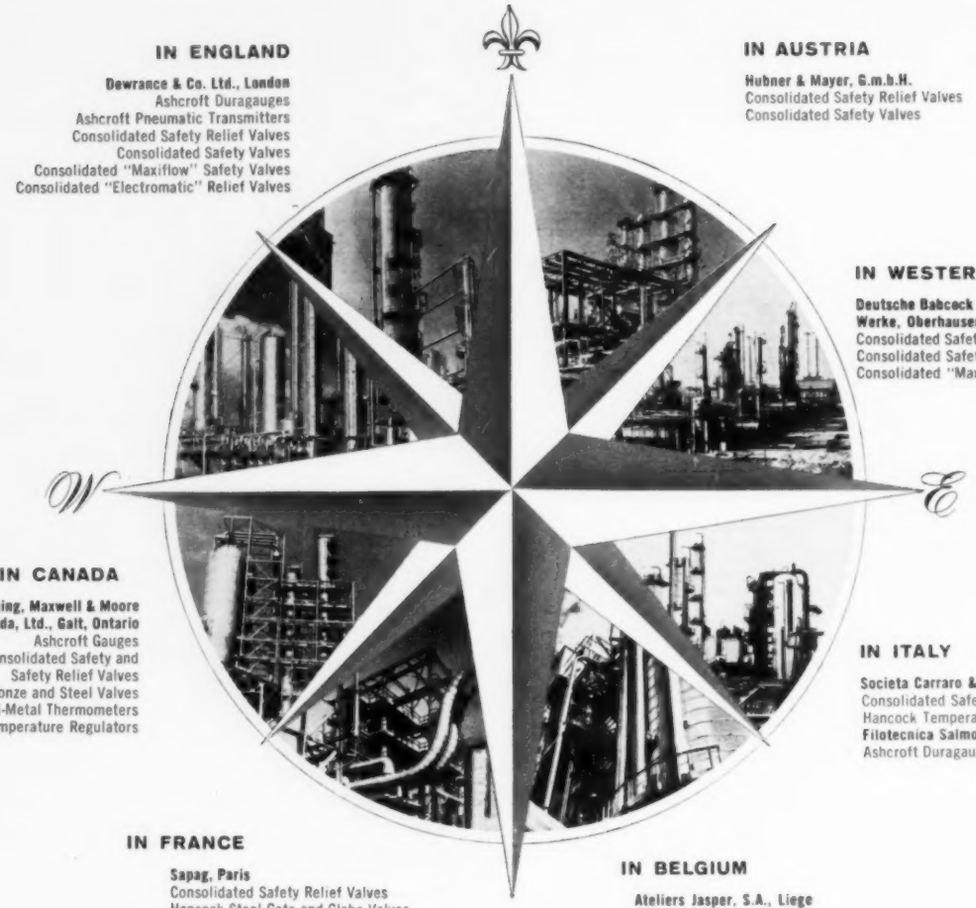
MODEL—Clark 2M7 Centrifugal Compressor. Horizontally split, down connected, with diaphragm cooling. Rated 1415 bhp. Capacity 7500 cfm. Gear driven by 1200 rpm electric motor.

APPLICATION—Air compressed from 13.36 to 73.36 psia to supply 40% of requirements of nine furnaces producing glass for 1,100,000 bottles daily.

CONDITION OF PARTS—Labyrinths like new, with original knife edge. Clearances well within tolerances.

- Rivets in factory condition, none loose.
- Impeller blades like new, no visible wear on trailing edges.
- Bearings and shaft like new. Slight marks and spots otherwise polished factory finish.
- Original oil still in machine in clear, clean condition.
- Discharge impeller (seventh stage), no bluing or heat effects evident.
- Discharge seals in excellent condition, no leakage.
- Thrust bearing like new, no markings.
- Slight wear evident on sleeve between first and second impellers. Probably due to silica dust in air.





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Consolidated Safety Relief Valves
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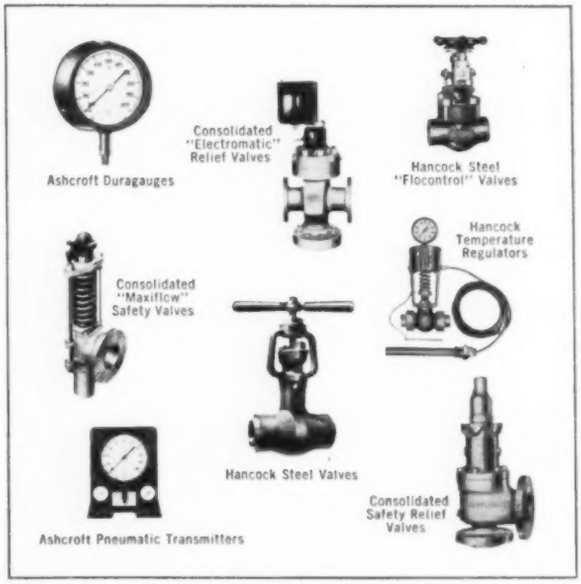

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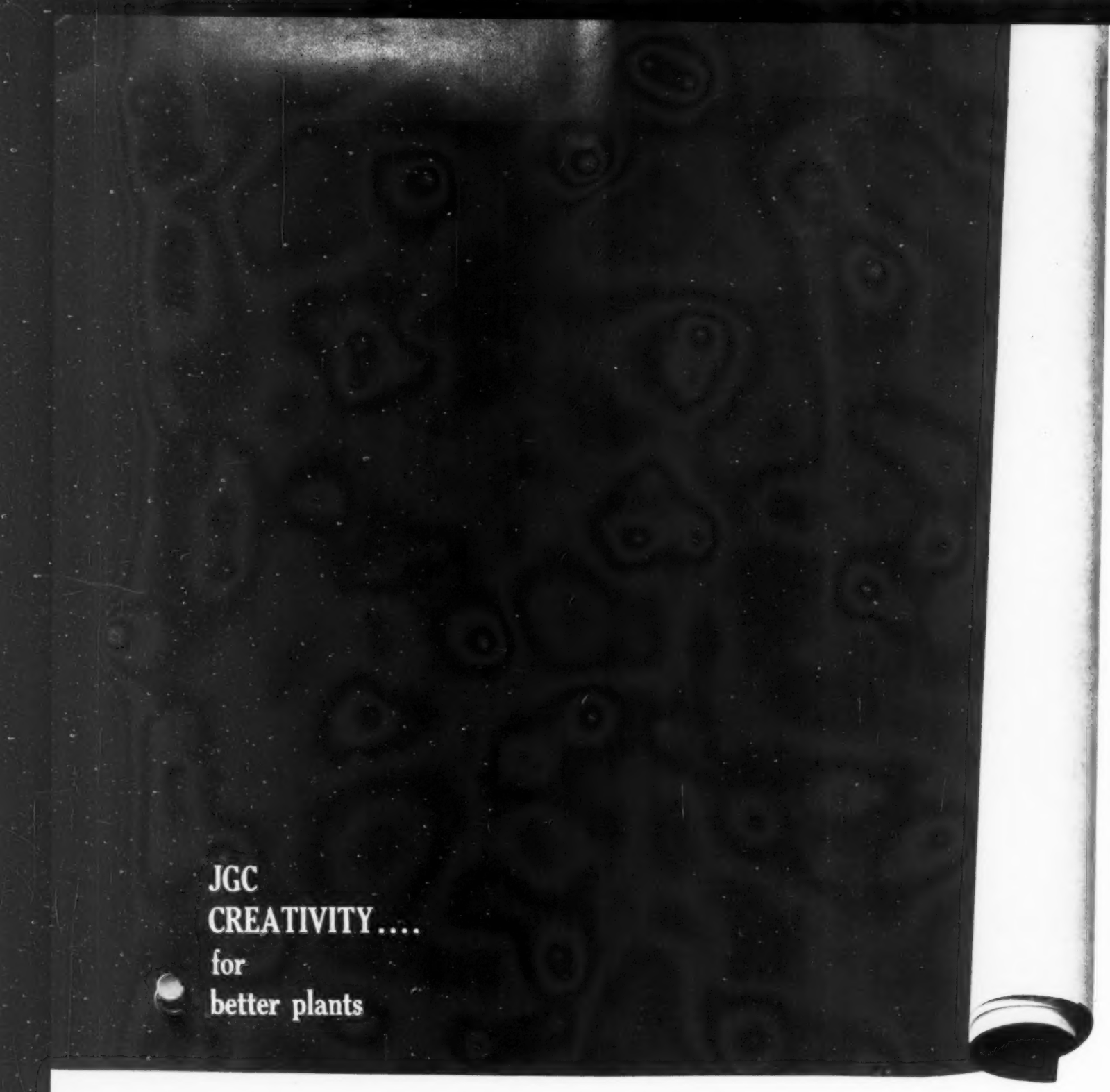

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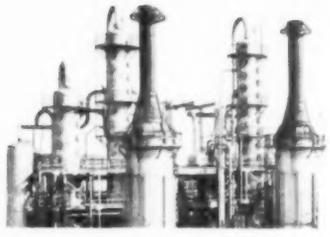

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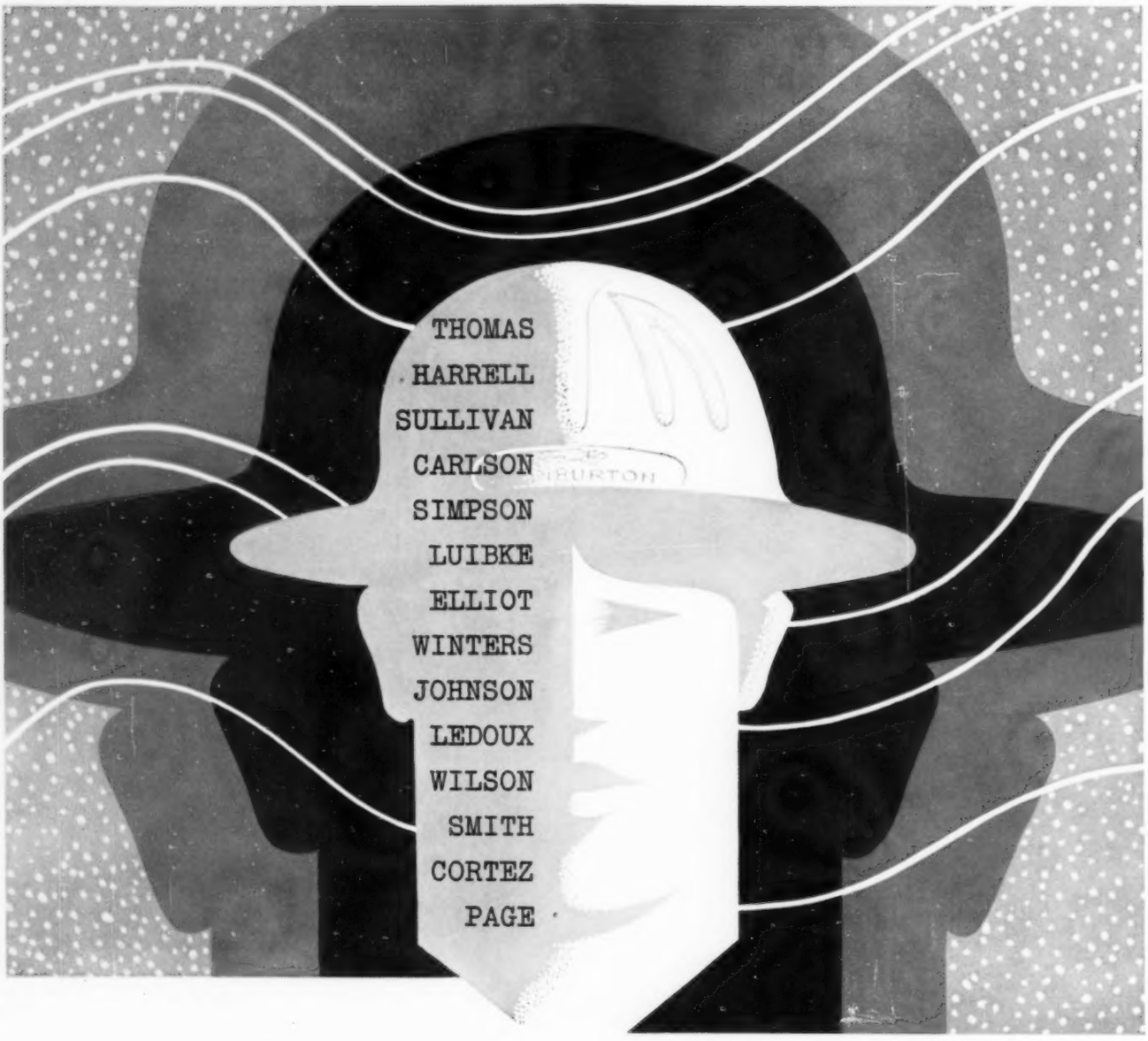

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PEMEX IN PERSPECTIVE

Almost a quarter century has passed since the expropriation decree was signed into law on March 18, 1938 and shook the oil world to its foundations. The government's monopoly for oil, Pemex, was established in that same year, a young fledgling with a difficult road ahead and few trained technicians to guide it.

Since then Pemex has grown into a real Mexican eagle. It is now the largest industrial concern in Mexico. It has over 40,000 employees and its autonomous budget is just about as large as the entire Federal government's. Pemex operations are among the most integrated in the world—perhaps the most integrated, since it transports its own natural gas in addition to exploring, producing, refining and marketing Mexico's oil.

In the following pages some of Pemex' activities are reviewed by the capable administrators who direct them. Other Pemex officials will review Pemex operations in a later edition of WORLD PETROLEUM. Their articles illustrate the enlightened and modern spirit in which Pemex is imbued. They are modern technologists in the best sense of the word, and working for them are more of the same throughout Pemex oil fields and refineries.

Time heals all wounds, and the scars of the expropriation are barely visible today. It probably would not have happened, in fact, under present-day conditions and attitudes in Mexico. It was a product of the times.

Mexico is proud of Pemex, and as a nationwide enterprise, Pemex has labored hard to merit that pride. Few employees of private companies work harder than the top personnel of Pemex. Yet even the most faithful Pemex executives admit it has been hard. "I'd like to see the genius that could make this company go!" shouted one recently. "Selling products for years at less than it cost to produce and refine them, then importing products to sell in Mexico and receiving less for them than we paid. I've gone nuts trying to run this big company on 180-day paper."

His comment underlines one of Pemex' big troubles: shortage of capital. As the company's 1961 balance sheet shows, with about 1.5 billion pesos in loans advanced, Pemex is chronically short of money. Capital in the amounts needed is not available in Mexico, so the company is forced on the international market. Although the situation there has improved in the last five years or so, international investors are sensitive to the slightest tremor and there have been enough tremors to prevent any really large long-term money from flowing in. The situation may improve, and Pemex has a large European money deal under discussion right now, but the burden of keeping pace with Mexico's burgeoning economy increases too.

The international aspect brings up one of the most difficult aspects of Pemex operations. Oil, by its very homogeneous character, is an international commodity. The oil industry thrives on competition and a diversity of judgments. Mexico has every right to be proud of Pemex but this inherent weakness of being all alone in Mexico's oil industry is a basic defect in Pemex structure.

Under the circumstances, it is doubtful if any company could make a complete success of it if put into Pemex' shoes. Even a company with the resources of the largest of the international companies, Standard of New Jersey or Shell, would lack the multiplicity of judgments and the spur that competition lends.

Any company, government or private, can be efficient using modern administrative techniques, says Pascual Gutierrez Roldan, the dynamic Director General of Pemex. His department chiefs point out several advantages to being one company. Production costs are lower, they say, because there is not the waste of duplication that occurs in the United States. For example, they are not obliged to drill offset wells, nor duplicate seismic work. They can set a steady pace in exploration, too, drill a set number of wildcats each year and build a dependable staff.

Certain strains and stresses are evident in Pemex nevertheless. They show up in a certain distortion of the company's effort. While Mexico needs modern refining facilities, especially catalytic cracking to convert her heavy crudes into usable products, the temptation to overly concentrate on visible, imposing structures such as tiled refineries has been almost overpowering. As a result the refining sector has been over-developed, at the expense of other sectors, especially exploration.

This concentration is understandable, especially since it is incumbent on any government-owned company to show results that the general public can understand. The public, however, is not knowledgeable enough to understand the need for dry holes as a necessary concomitant of exploration, while a new refinery is much more easily appreciated.

Thus, Pemex is not in an easy position. Forced to concentrate on refining at the expense of exploration, its production cushion has shrunk. Using the forecasts of a 6.5% annual increase in demand which Pemex supplies in this issue, it seems likely that a serious production shortage may be in the offing. It may be that there is unsatisfied demand in the country already. In any case, the situation will become steadily more serious, since the average production increase during coming years is estimated on the basis of past performance at only about 3%.

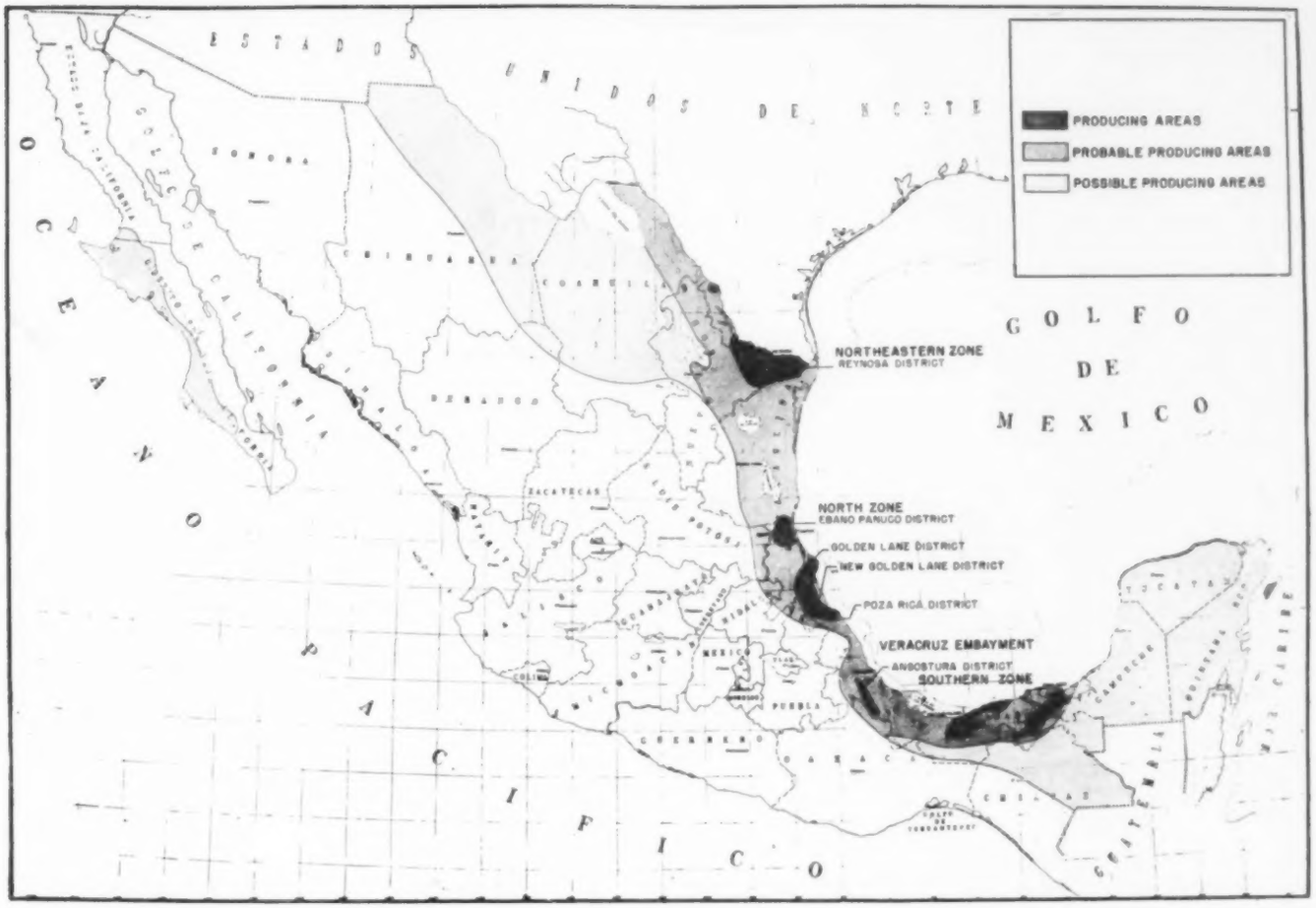
The financial and energy burden on Pemex will undoubtedly increase steadily in the years ahead. Petroleum now supplies 92% of the total energy used in Mexico and every increase in energy use means Pemex must supply most of it. The tragedy lies in the fact that the funds it invests are funds that the government is thereby deprived of for use in education, transportation and other governmental functions for which it is directly responsible. They are funds which could be readily obtained from private sources, given the proper legal framework.

A member of a geological crew for Pemex in a clearing in Mexico's tropical wooded area

Mexico's exploration grows

by Antonio Garcia Rojas
Exploration Manager
Petróleos Mexicanos

Oil and gas reserves are now at their peak in the nation's history. Future development is expected to continue at a steady pace



Oil and Gas Districts in Mexico

THE STATE OF DEVELOPMENT of the oil industry in any country is reflected, to a considerable extent, by the rate of discovery of new petroleum reserves. In Mexico, since the time that the government took control of the oil industry, Petroleos Mexicanos, the government agency, realized that the success of the enterprise was going to be based on its ability to discover and develop new reserves, not only in those areas where oil fields already existed, but in the prospective areas which had been left untouched, mainly due to the difficult exploration problems, both operational and geological.

The success of the Mexican exploration effort can be judged by the systematical increase in the proven reserves of the country, as shown in the accompanying chart.

Mexican oil reserves are at present at their peak in the history of the country. More important is the fact that the bulk of them are located in fields which have been discovered during the last 10 years, as shown by the trend of the curves.

The present status of the oil and gas reserves of Mexico, as per January 1961, is given by separate table.

Taking into consideration the calorific power of oil and gas, present reserves of fields discovered during the last 10 years, many of which have not been fully developed, represent 57% of the total.

The producing districts and the most important prospective areas are located in the eastern part of the country.

Northeastern Mexico

The northernmost producing fields of Mexico are located in the northern part of the state of Tamaulipas, in the southern geological extension of the Rio Grande Embayment of the Gulf Coast Province of Texas and Louisiana.

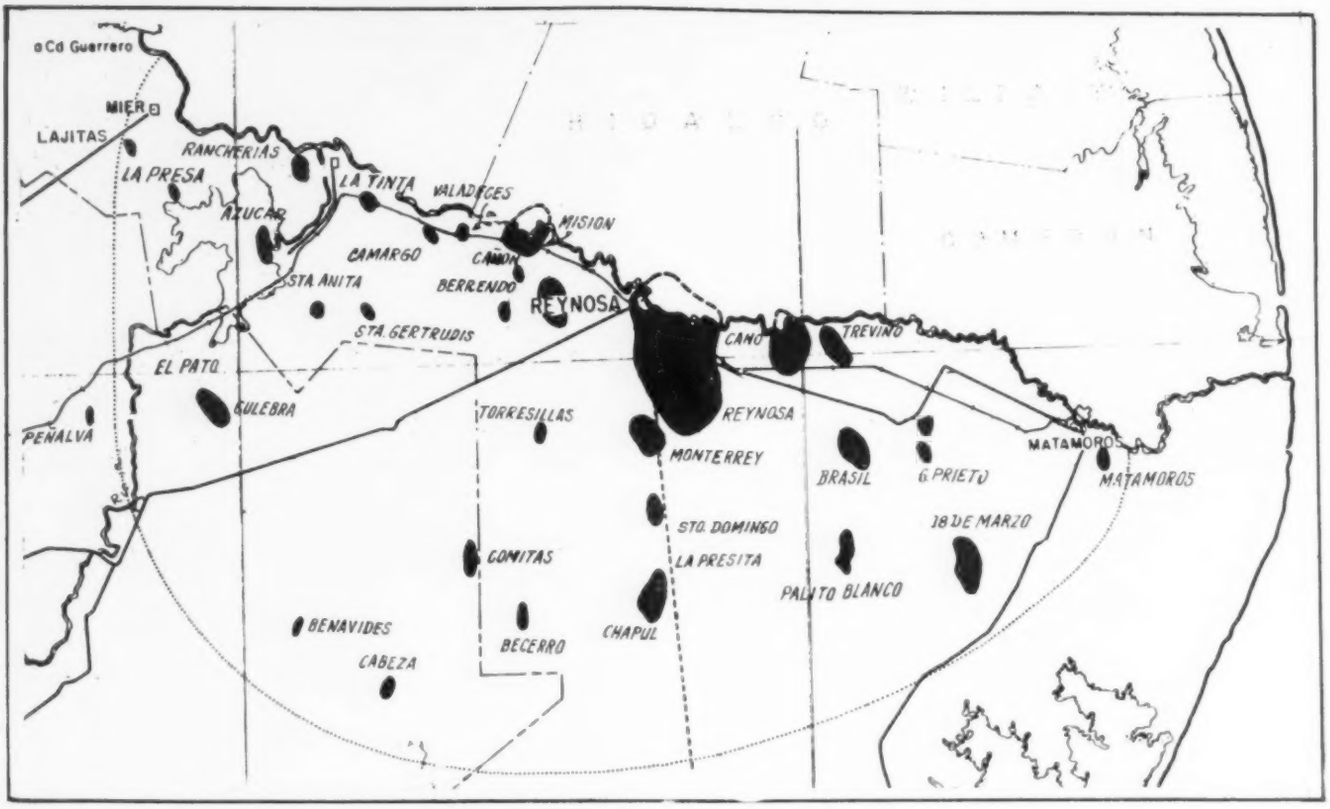
This is a very important gas producing area, with small oil production, as shown below:

	Daily Production
Dry Gas	350 Million Cu. Feet
Absorption Plant Liquids	6623 Barrels
Oil and Condensate	2761 Barrels

In this area there are at present 32 fields, most of them located in anticlinal, frequently faulted, structures.

The reservoir rocks are sands which range in age from Eocene to Miocene, with the bulk of the reserves and production com-

Antonio Garcia Rojas



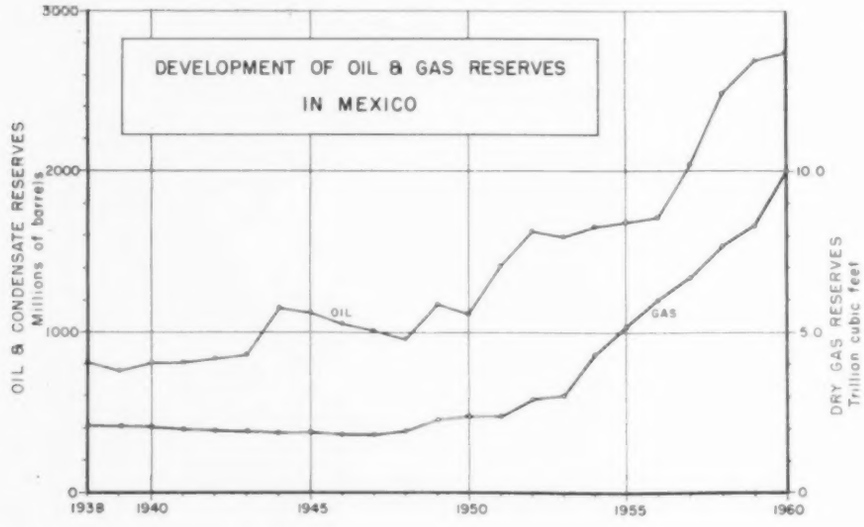
Fields of Northeastern Mexico

ing from the Frio and Anahuac formations.

Reynosa is the principal field of the district with reserves of about 1.9 trillion cubic feet of gas, followed by Brasil, Cano, Treviño and 18 de Marzo, which have in total a reserve of more than 0.95 trillion cubic feet of gas. The major portion of the remaining reserve is in fields under development, and as practically all the fields of the district, including Reynosa, are in the stage of development, present proven reserves of the known fields will undergo a material increase.

Although exploration in the area began in the first decade of this century, until 1938 only four small fields had been discovered, and the effective development of the district began during the last twelve years. For this reason the district is still slightly explored compared with similar areas of the United States, notwithstanding that its possibilities are comparable to those of Southwest Texas.

Present possibilities for future developments are seen in the extension to the South of the producing areas, in the development of additional fault and stratigraphic traps in the already producing areas, the development of deeper production both in Oligocene and Eocene sands and in the opening of Cretaceous production towards the northwest.



North Zone or Tampico-Tuxpan Embayment

The Tampico-Tuxpan Embayment has been the most important producing area of Mexico and continues in its leading position both in proven reserves and in possibilities for the development of new oil fields.

Until 1956 all production found in this district came from Cretaceous limestones which vary from highly fractured to reef limestones. In 1956 Jurassic limestone production was found and at present this accounts for 30% of the total production of the area.

Geologically the fields of the Tampico Embayment can be grouped in three general areas: Ebano-Panuco, Golden Lane and West of the Golden Lane. A recent discovery in the foothills of the Sierra Madre (April 1961), not yet evaluated, may add a new area to those mentioned above.

The Ebano-Panuco District is formed by a group of old fields, producing from fractured rocks varying in age from Middle to Upper Cretaceous, which have an accumulated production of more than 850 million barrels, and which at present produce 15,000 barrels of heavy oil per day.

During 1956 the Tamaulipas-Constituciones field, producing from Lower Cretaceous and Upper Jurassic limestones, was discovered, and at present most of the production (32,000 barrels daily) and most of the reserves for this district are coming from this and some other new fields.

South of Tampico are located the fields of the Golden Lane, which extend along a buried reef of Cretaceous age. These fields were developed in two different periods, the first between 1908 and 1928, along a line 56 miles in length, between San Diego and San Isidro. The rest of the fields, which are called New Golden Lane Fields, were discovered and developed between 1952 and 1956, along a line 50 miles in length, between San Isidro and Tecolutla.

Present production of the old Golden Lane fields is 11,100 b/d (barrels daily), and production from the new Golden Lane fields is 27,700 b/d, making a total of 38,800 b/d, most of it of 22° API oil.

West of the Golden Lane there are a group of fields, all of which, except Poza Rica, are recent discoveries. These fields produce from Cretaceous limestones of reefal and clastic types, at depths varying from about 1,900 to 3,000 meters. Poza Rica field, discovered in 1930 has produced 787 million barrels and is currently producing at a rate of 60,000 barrels of oil per day. Along this trend, Jurassic production was established during 1956 in the San Andres-Hallazgo oil field, where currently a production of about 46,000 b.o.p.d. has been established.

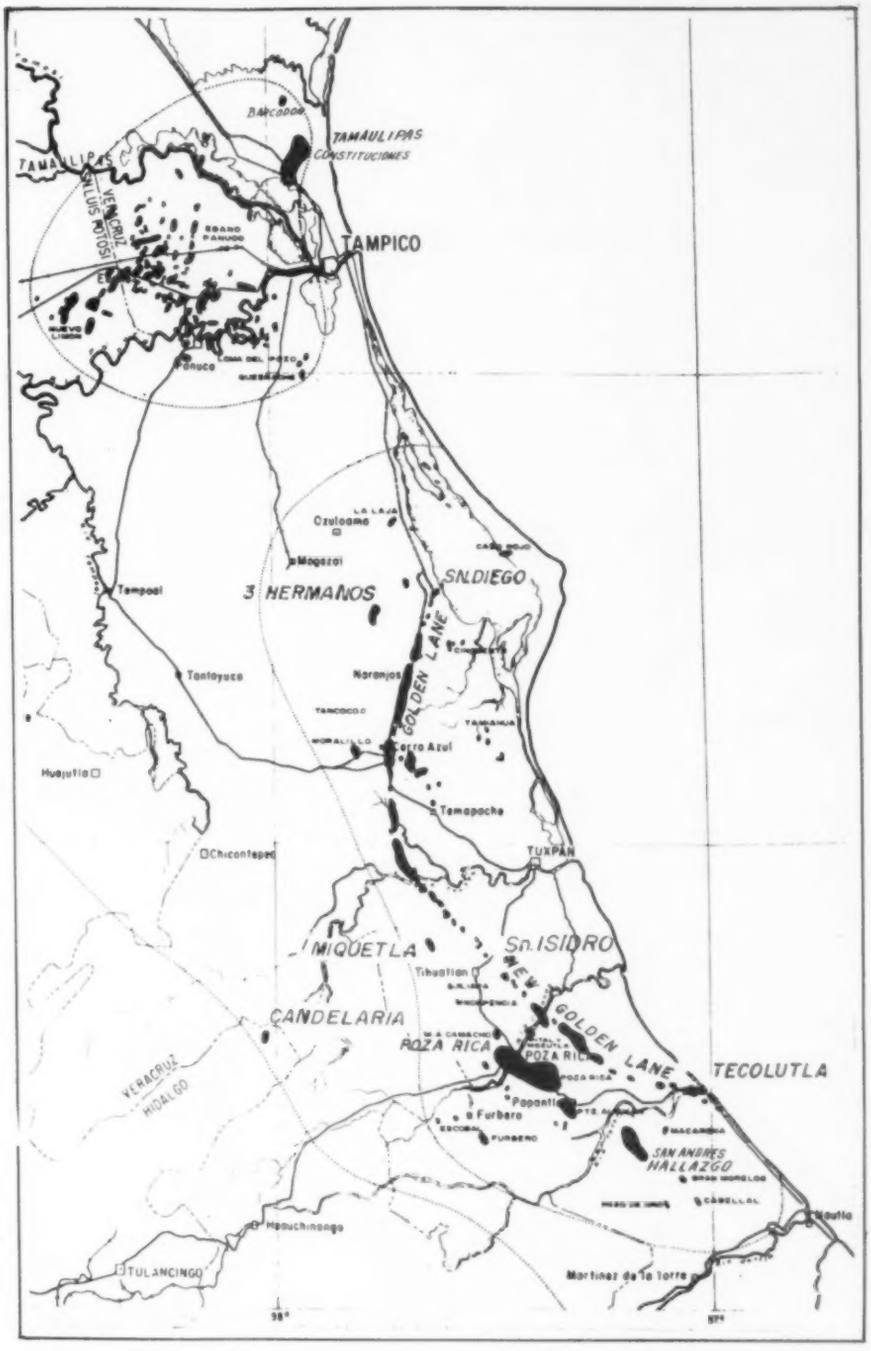
Present production in the Tampico Embayment is as follows:

Ebano Panuco District	47,000 b/d
Golden Lane:	
Old Fields	11,000 b/d
New Fields	27,000 b/d
West Golden Lane	131,000 b/d
Total:	216,000 b/d

The prospects for development of new oil reserves of the Tampico Embayment appear very good if judged in the light of drilling during the last five years, during which the new fields of San Andres-Hallazgo, Miquetla and Tres Hermanos have been discovered. These fields at present have a known total reserve of more than 440 million barrels of oil and they are far from being fully developed.

Present information shows that structural type oil fields will continue to be the immediate objective for exploration drilling, but stratigraphic type oil field prospects are very important, as shown by Tres Hermanos, which can be considered the first purely stratigraphic prospect where important oil production has been established.

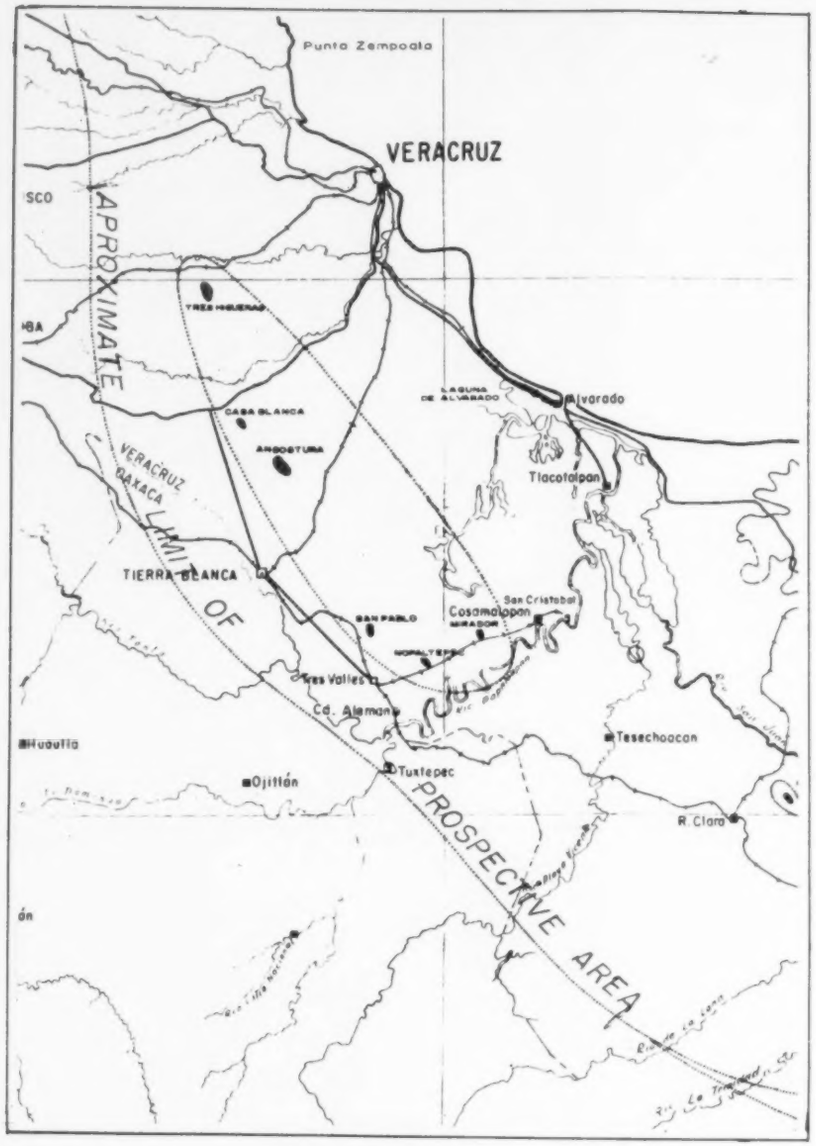
As mentioned above, during 1961 light oil production was established at Candelaria well in a new trend, in the foothills of the Sierra Madre, in Lower Cretaceous limestones. If future drilling in this area proves the existence of similarly large fields as have been found in other parts of the Tampico Embayment, the Tampico Region



Tampico-Tuxpan Embayment

RESERVE STATUS OF PETROLEOS MEXICANOS
(January 1st, 1961)

ZONE AND DISTRICT	OIL & CONDENSATE Million Barrels	DRY GAS Billion Cub. Feet
NORTHEASTERN ZONE		
Reynosa District	50	3393
NORTH ZONE		
Ebano Panuco District	231	318
Golden Lane District	280	461
Poza Rica-San Andres District	1814	2697
VERACRUZ ZONE		
Angostura District	3	137
SOUTHERN ZONE		
Isthmus District	74	75
West & Central Tabasco District	200	151
Macuspana District	111	2888
Total	2763	10120



Veracruz Embayment

will remain for a long time the most prolific in Mexico.

The gas reserves of the Tampico Embayment oil fields are also of great importance and at present they amount to 3.5 trillion cubic feet, with a tendency to increase with the development of the recently discovered oil fields.

Veracruz Embayment

The most recent oil and gas producing province of Mexico is located in the Veracruz Embayment, where oil production was discovered in Upper Cretaceous limestones in 1953 at the Angostura oil fields. New oil discoveries were made in subsequent years at Casablanca and Tres Higueras, but the reserves are of minor importance.

Gas production has also been found in this embayment, both in the Upper Cretaceous limestones (at San Pablo and Nopaltepec) and in Tertiary sands (at Mirador and Mata Verde), but in generally both the oil and gas prospects appear poor if seen in the light of past discoveries and the complex structural conditions and quickly varying stratigraphical section of this province.

Southern Zone

The Southern Zone, which extends from the southeastern part of the state of Veracruz, to the state of Tabasco and western Campeche, was developed in the southern part of Veracruz, prior to 1938.

In this western area oil production is found in Miocene sands on the top and flanks of shallow salt domes. During the last ten years the producing area has been extended to western and central Tabasco, where geological conditions are similar, with deep seated salt domes.

In the eastern part of Tabasco gas production was found in Jose Colomo during 1951 and reserves over 2.8 trillion cubic feet have been developed since.

In 1961 the Nanchital field, still under development located in the foothills of the Sierra Madre, production from the Cretaceous limestones was found, opening good prospects for Cretaceous production along a belt near the mountain front, but its development will be delayed to some extent due to difficult access in very hilly country.

Prospective oil development in the plains, where Miocene production is found, appears very favorable as all fields in Tabasco began its development until the last few years, providing at present more than 72% of the oil of the South Zone and practically all gas production of the zone, as shown below:

Daily Production from Southern Zone

	Oil (barrels)	Gas (Mmcf)
Southern Veracruz fields	19,000	13
Tabasco fields	52,300	350

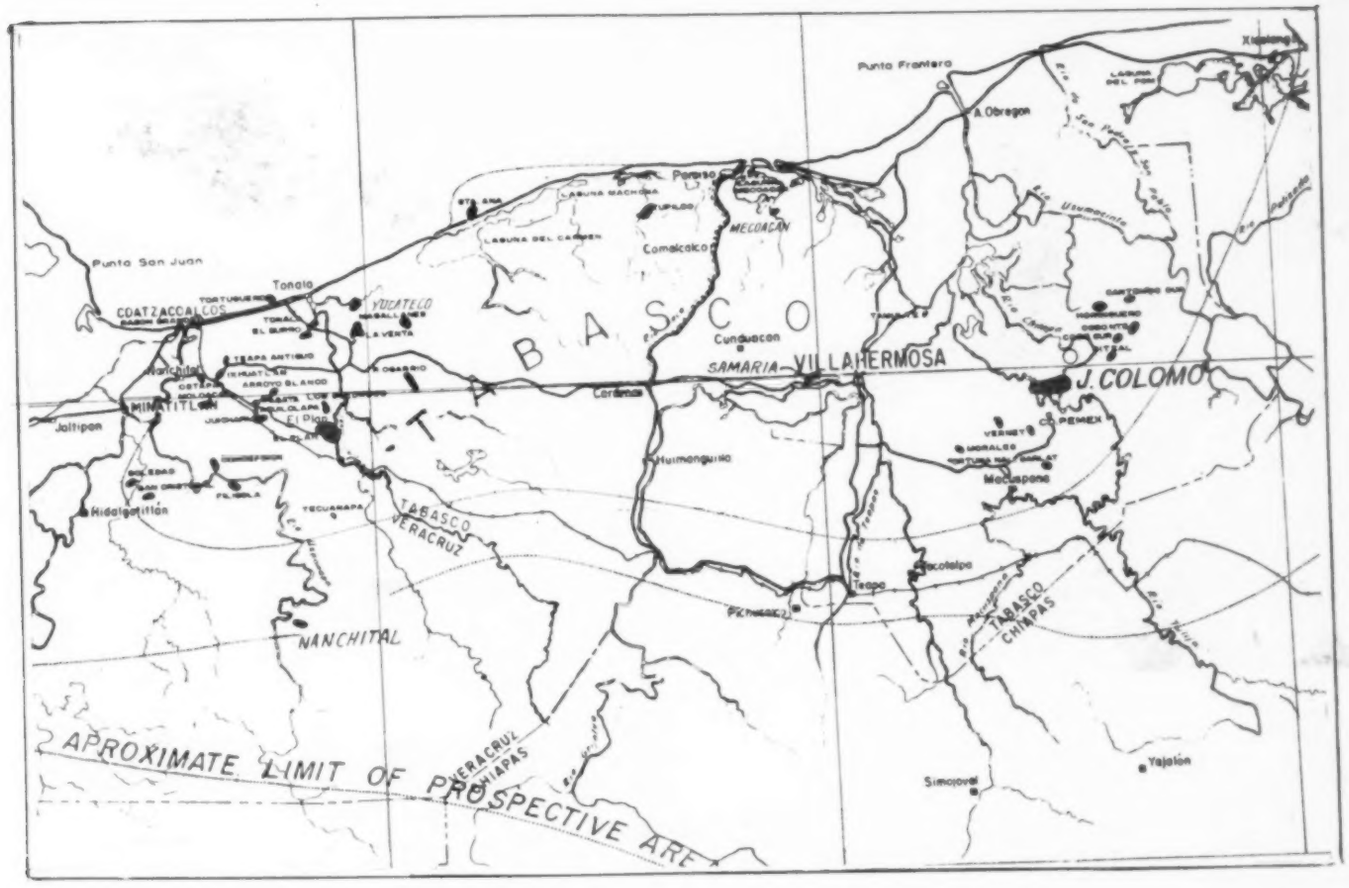
Technicians of a geological crew at work in a field office

The eastern part of Tabasco and western Campeche where José Colomo field is located, offers very good prospects to develop new gas reserves and its exploration and development will be accelerated with the opening of the gas line from eastern Tabasco to the central part of the country, which began its operation early this year.

In summary, the recent exploration work done in Mexico has resulted in the discovery of many new fields, and in the opening of some new producing areas. This situation points to the probability of continuity in the improvement of the country's reserve and production situation at a rate comparable to that of the last few years.

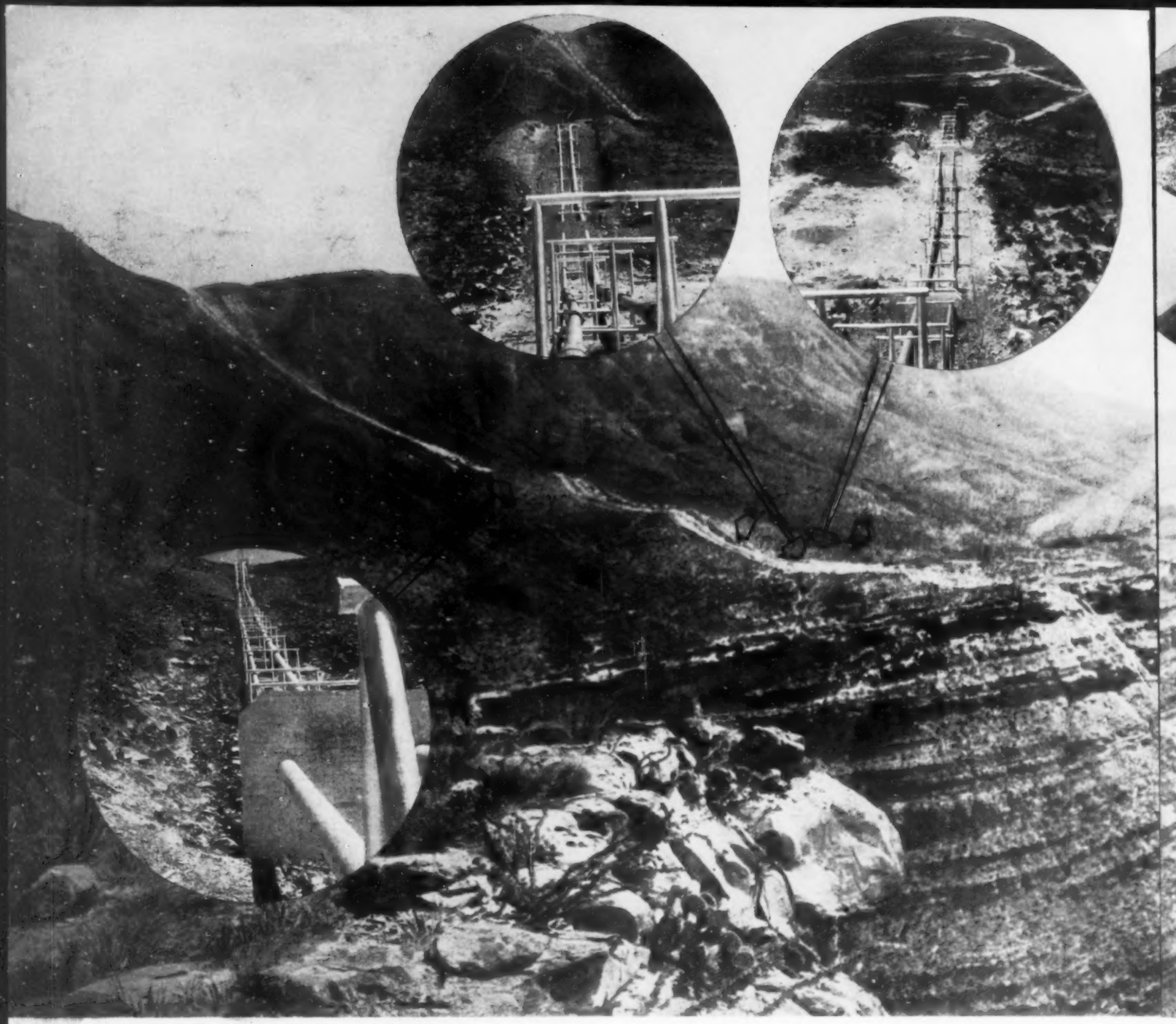
END

Seismic equipment in operation in Tabasca, near Tamulté



Above: Fields of the Southern Zone

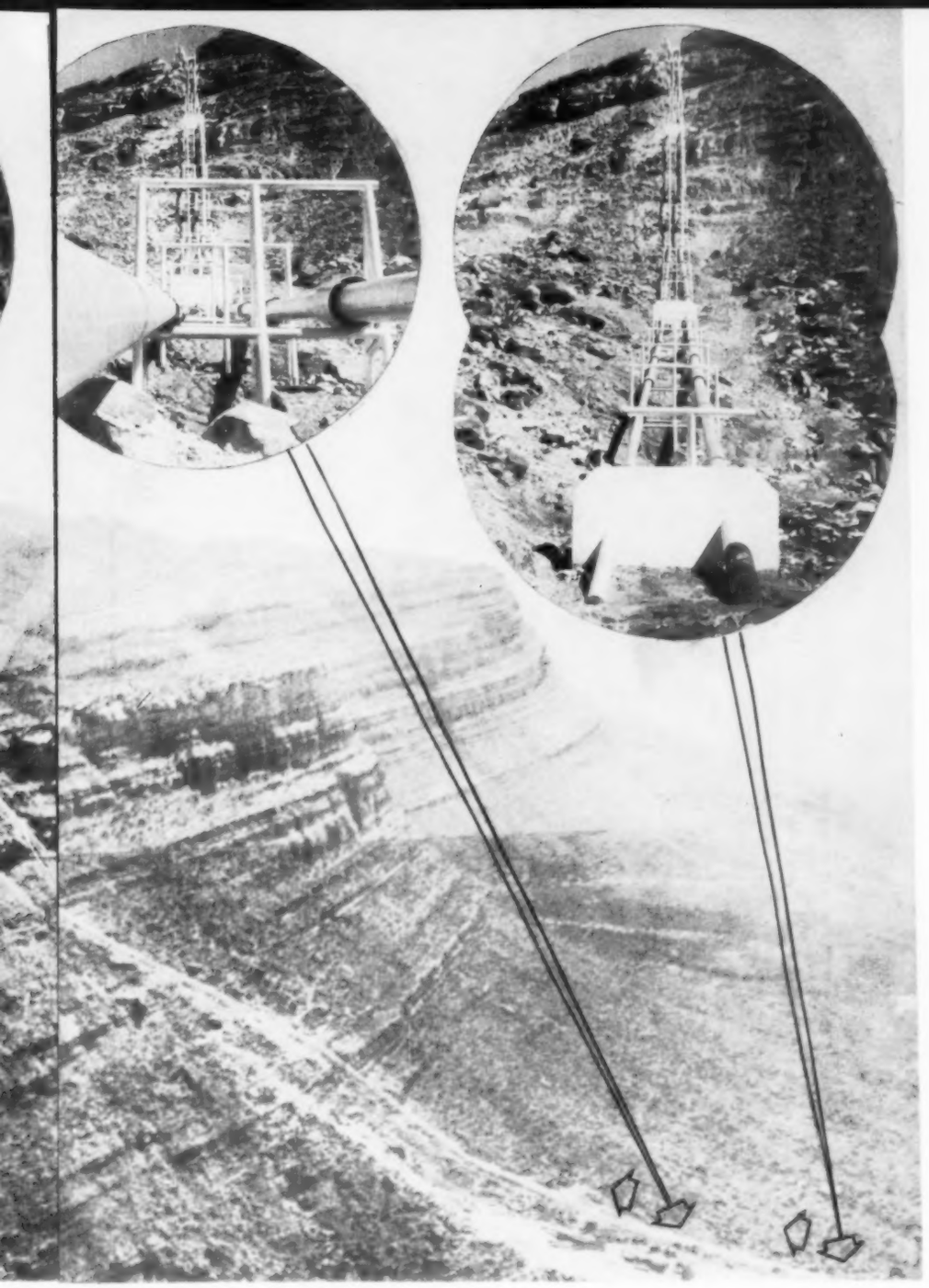
Two rigs at Altamira camp near Tampico



Pipeline systems of Pemex

by Ing. Bruno Mascanzoni and Ing. F. Xavier Peredo

With existing lines for crude, natural and gas totalling 5,228 miles, Pemex plans 1,175 miles of new lines and expansion projects. During 1961 42.2 million dollars are to be expended for underway projects, plus 6.5 million dollars for new lines



View of the extremely difficult terrain crossed by the Monterrey-Torreón gas and products pipelines. Known as "El Pinto," this section drops 1100 feet in 3,800 feet of line.

THE MAIN PURPOSE of Pemex pipelines built before 1938 was to transport crude production from fields to the ports of Tampico, Tuxpan and Minatitlán; either for export as crude or for partial refining and export of products.

The only exceptions were one 10-inch oil line 148 miles long from Palma Sola to Azcapotzalco, near Mexico City, with a capacity of 7,500 b/d, and another line 97 miles long of 12 inch diameter between San Pedro de Roma (today Alemán City) and Monterrey, used to import natural gas from the United States.

Other oil and gas pipelines in 1938 were the following:

(1) System Poza Rica-Cobos, Tuxpan-Tampico, 440 miles with diameters of 6, 8, 10 and 12 inches.

(2) System for the fields of Faja de Oro, 198 miles long with diameters of 6, 8, 10 and 12 inches.

(3) System Ebano, Pánuco, Cacalilao, Reventadero, 218 miles long with diameters of 4, 6, 8 and 10 inches.

(4) Systems of fields of South Zone, 130 miles long, for gas and oil with diameters between 6 to 10 inches.

In 1938 there were approximately 1,231 miles of lines 1,070 miles for oil and 161 for natural gas.

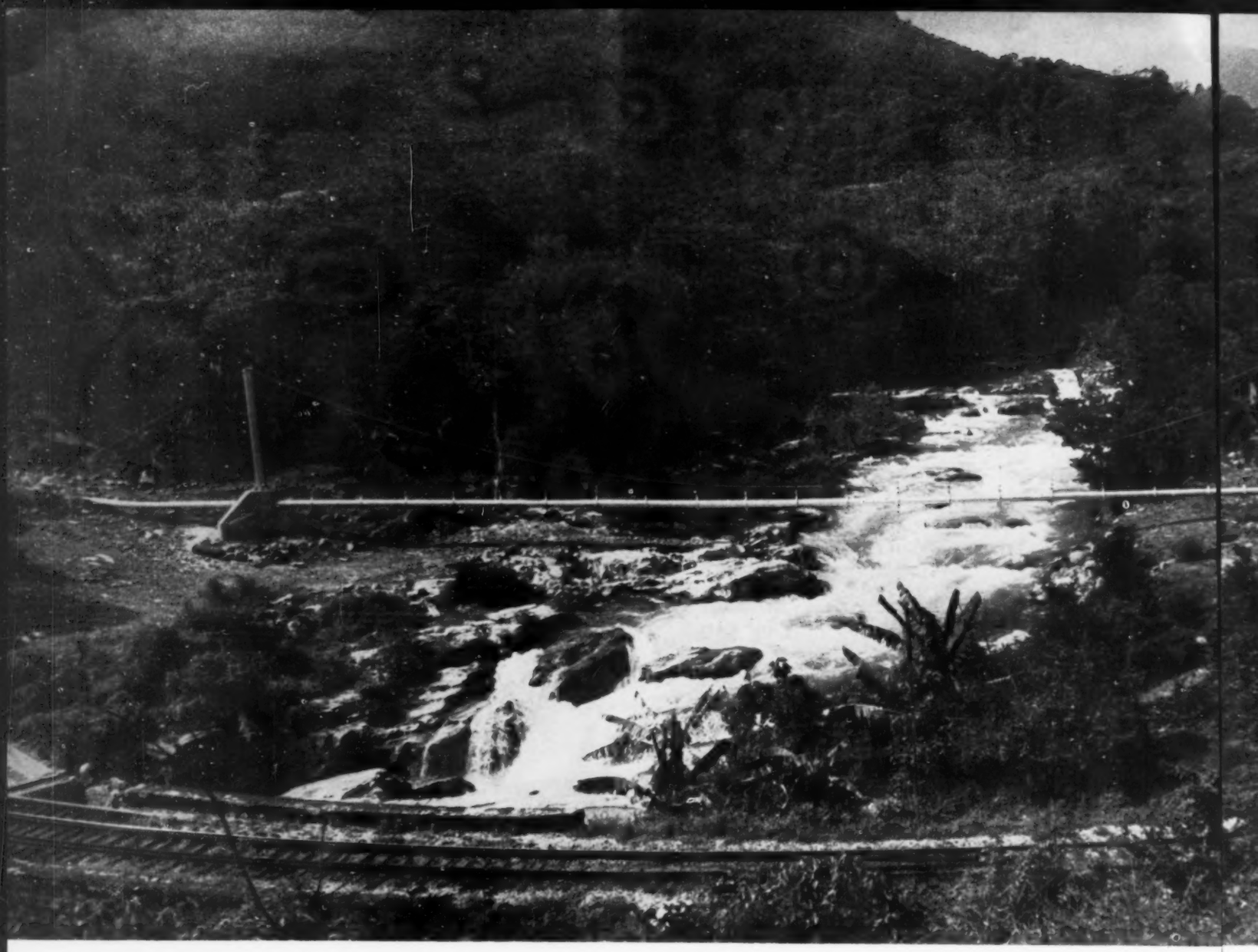
The Mexican industrial growth trend is demonstrated by the growing network of oil and gaslines built by Petróleos Mexicanos from 1938 to-date. From oil fields on the Gulf coast, new lines toward the west have been installed to furnish crudes to refineries located in the middle of the country (Azcapotzalco and Salamanca). From these refineries new lines transport finished products to distribution and consumption centers

BRUNO MASCANZONI, civil engineer, graduated from the University of México in 1933. He joined Pemex in 1938, in the production department. Since that time he has been connected with pipeline work. Presently he is assistant coordinator in charge of planning, design and construction of pipelines in Pemex. For 15 years he has been professor of mathematics and physics in the Engineering School and in the Science School of the University of México.

F. XAVIER PEREDO joined Petróleos Mexicanos in 1951 as a civil engineer. Since 1955 he has been engaged in pipeline design and construction. In 1956 he was in Bartlesville, Okla., with Phillips Petroleum Co. working as a Pemex representative in the Tampico-Monterrey products pipeline design and engineering. In 1957 he was made construction superintendent for the Reynosa-Monterrey gas pipeline construction, and in 1958 he was promoted to general pipeline construction superintendent. He is a graduate of the University of Guadalajara, and attended the School of Pipeline Technology in Baytown in the spring of 1957.

Ing. Bruno Mascanzoni

Ing. F. Xavier Peredo



(Guadalajara, Morelia, Aguascalientes, Monterrey and Salina Cruz).

A comparison of changes from 1938 to-date is given in the following figures:

In 1938, only 7,500 b/d of crude oil was transported to the Central Plateau through the single 10-inch pipeline available.

In 1961 there are three oil lines, two gaslines and one propane line, with capacities of 150,000 b/d of crude, 4,000 b/d of propane and 335 mmcf/d of natural gas. This is 20 times 1938's volume, not including the natural gas.

Petróleos Mexicanos has discovered big fields of natural gas in northeast Mexico for which a large network of gaslines was built. There are also new oil fields at Angostura, Veracruz, José Colomo and Tabasco which make imperative the construction of new oil and gaslines in those regions.

At present Petróleos Mexicanos has a grand total of 5,228 miles of pipelines distributed as follows: oil, 1,974 miles; products (including gasoline, kerosene, diesel fuel, butane and propane), 1,235 miles; and natural gas, 2,019 miles.

Oil Lines

Since 1958 to date, about 155 miles of oil lines have been built with diameters ranging from 4 to 22 inches. They connect new producing fields to main lines which previously carried oil production from old fields to refineries. Principal new line is from Monterrey to Torreon. It is 216 miles long, 10¾ inches in diameter. Pipe is 0.219 inch thickness, API std.-5LX pipe, Grade X-42, seamless, manufactured by Tubos de Acero de México, S.A.

This line was built to operate under a maximum pressure of 1,220 psi, able to carry as much as 25,000 b/d of diesel fuel or 35,-500 b/d of gasoline with two pumping stations; one in Monterrey and other at Cuesta de los Muertos, about 61 kilometers west of Monterrey.

It was finished in October 1960 at a total cost, including pumping stations, of $8 million. Distributing terminal for this line is at Gomez Palacio, Durango, with a total storing capacity of 375,000 bbl. It was ready to operate at same time as the products line and its total cost amounted to $3,680,000.

Gas Lines

Escobedo-Monclova—This is a branch of the Reynosa and Monterrey (Nuevo Laredo) gasline of 22 inch diameter. It is 108 miles of 10¾ inch pipe (0.219 inch in thickness) API—5 LX, grade X-42, electric welded seam, made by Tubacero of Monterrey, using plates from Altos Hornos de México, S.A.

This line was built between the end of 1958 and June 1959. Its main purpose is to furnish gas to the steel plant of Altos Hornos de México, Monclova, and its initial capacity, without compression stations, is 30 mmcf/d. Total cost was $2.4 million.

Ciudad Pemex, Mexico City—This line is 486.6 miles long, 24 inches outside diameter, API—5LX, Grado X-52, electric welded at length, 0.344 inch thickness for uninhabited places, 0.438 inch for inhabited zones and 0.625 inch for undercrossing big rivers. It was manufactured at Monterrey by Tu-

A suspension bridge for the Rio Blanco crossing of the Ciudad Pemex-Mexico City gas pipeline. The span shown is 270 feet.

bacero with plates from Altos Hornos de Mexico S.A., Monclova, Coahuila.

Construction started in May, 1959, and was finished in December, 1960. This line was designed to operate at a maximum pressure of 1,075 psi, running in its initial stages at a rate of 220 mmcf/d. In its second stage, with nine compression stations, the line may be able to transport as much as 500 mmcf/d. Approximate cost of this line with distribution branches, but not including compression stations, was $50 million.

Natural Gas Distribution System in Mexico Valley—This system was designed to furnish natural gas to 60 industrial plants supplied by the old system, from Poza Rica, and to about 200 additional industrial plants located in this valley. Its construction was started October 1960 with plans for completion in April of 1961. It is about 80 miles long with diameters varying from 24 to 2 inches.

Mexico D.F.—Salamanca, Guanajuato—This line is an extension of the Ciudad Pemex—Mexico City line toward the interior of the country and is 166 miles long. Construction started in July 1960 with completion scheduled for this April. The line is 14 inch O.D. and it is 0.250 inch thick. Steel is API Std., 5LX, grade X-52, seamless, built by Tubos de Acero de Mexico, Veracruz.

In its initial stage, this line will handle 100 mmcf/d with only one compression station at Mexico City, D.F. Total cost including compression station is $9 million.

Monterrey—Torreon—This line is composed of two sections. The main one is 16 inch O.D. pipe, 193 miles, between Monterrey, Nuevo Laredo and Chavez, Coahuila; the other one is 12¾ inch pipe, 21 miles, between Chavez, Coahuila; and Gómez Palacio, Durango. The last section changes its diameter because Chávez is the starting point for the gasline to Chihuahua and 12¾ inches is enough to transport the volume for gas consumption at the towns of Torreón, Gómez Palacio and Lerdo.

For its construction, 20,500 short tons of 16 inch O.D. pipe, 0.250 inch thickness, API Std.—5 LX, grade X-52, seamless, was manufactured by Tubos de Acero de México, S.A., at Veracruz. This line was built to operate a maximum pressure of 1,000 psi and it can handle 50 mmcf/d without any compression station. When furnished with a compression station later at Ojo Caliente, 40.6 miles west of Monterrey, it will handle 94 mmcf/d. Approximate total cost is $9,280,000.

Branch to Angostura and Veracruz—In order to supply natural gas to the city of Veracruz, one branch was built at Tierra Blanca, Veracruz, from the gasline Ciudad Pemex-Mexico. At Angostura field it joins the existing line of 20 inch to Veracruz. This branch is 12.5 miles long, 10¾ inch O.D. pipe, 0.219 inch thickness, API Std.—5LX, grade X-42. From Angostura to Veracruz the above-mentioned 20 inch pipe (formerly used for crude oil) was conditioned in 1960 to transport natural gas.

The new branch was finished at the end of 1960 at a total approximate cost of $300,000. Maximum capacity of the Veracruz branch is 62.5 mmcf/d with no compression stations.

New Lines Planned and Under Construction

Products Line Gomez Palacio—Chihuahua—Construction of this line started at the beginning of January, 1961 with a maximum of 18 months for completion. It is 271 miles long, 8⅝ inch diam. and 0.219 inch thickness. Pipe is being made by Tubacero of Monterrey using steel plates from Altos Hornos de Mexico, S.A., following longitudinal seam welding by high frequency "thermatool."

Specifications are API Std.—5LX, grade X-42. This line will have an initial capacity of 14,000 b/d with two pumping stations, under 1,300 psi. The capacity may be increased to 21,000 b/d by means of additional pumping equipment. Approximate total cost is $6,240,000.

Gas line Chavez (Coahuila)—Chihuahua—Construction of this line started in January 1961 and it should be finished by December 1961. It is 268 miles long, 12¾ inch diam. and 0.250 inch thickness, API Std., 5LX, grade X-42, also built by Tubacero with steel plate from Altos Hornos. Working pressure is 1,000 psi, capacity as much as 22 mmcf/d without compression stations. Later, one station at Chavez will enlarge its capacity to 38 mmcf/d.

Both oil and gas lines mentioned above are under construction by Fabricas Protexa, S.A. and Constructora Indé-Conducciones, S.A. for a total approximate cost of $10.4 million.

Products line Ciudad Pemex—Mexico, D.F.—Plans are to start construction during 1961. The line will be 508 miles, 12¾ inch diam. 0.250 inch thickness, seamless, API Std. 5LX, grade X-42, built in Mexico by Tubos de Acero de Mexico, S.A.

The line has been designed to transport at the initial stage 35,000 b/d with nine pumping stations. With additional pumps, it would be able to carry 60,000 b/d.

Products to be handled include propane and butane between Ciudad Pemex and Minatitlán; and Mexico City, D.F. Approximate total cost is $18.4 million.

Crude oil line, Poza Rica—Tampico—Also planned for 1961, this line will be 128 miles long, with 18 inch pipes O.D. and 0.312 inch thickness, API Std., 5 LX, grade X-42, longitudinal seam, welded by immersed-arc procedure.

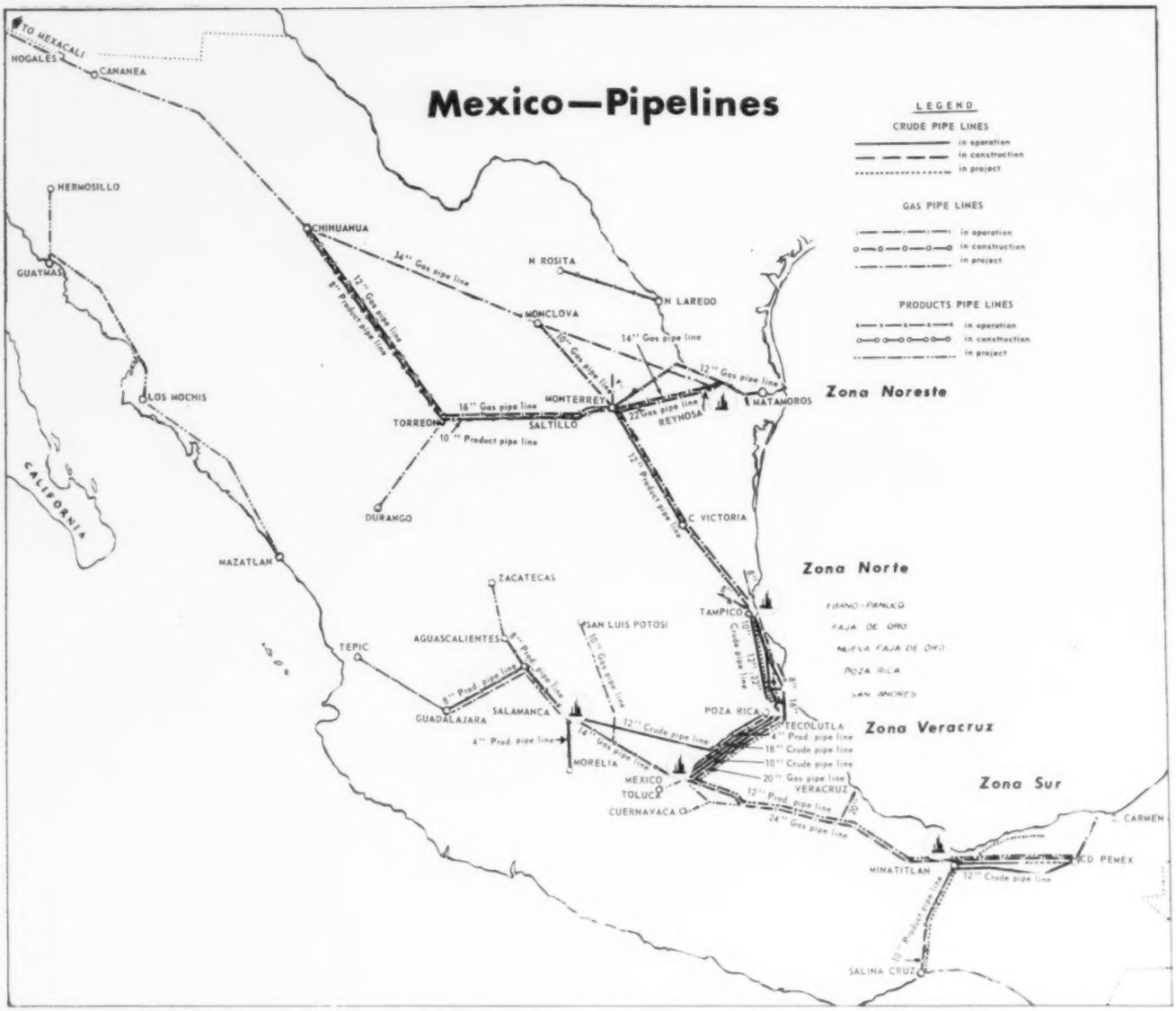
This line will take crude oil from wells in the Poza Rica district and others along the route to the refinery at Ciudad Madero, Tamaulipas; replacing a system of several lines with small diameters. Initial capacity will be 80,000 b/d with a single pumping station at Poza Rica. Approximate total cost $7.2 million.

Branch of Gas line Mexico—Salamanca to Queretaro and San Luis Potosi, and Gas line Salamanca—Guadalajara—These two lines to be constructed are now under study to determine final characteristics and they will complement the gas distribution system from Ciudad Pemex to the central part of Mexico.

Products line, Mexico D.F.—Puebla, Cuernavaca and Toluca—This is a system of lines of small diameter and short length, supplying products from the refinery at Azcapotzalco to several towns near Mexico City.

Products lines, Mazatlan—Guaymas—Hermosilio—This system would complement the projected refinery at Mazatlan, for distributing products in the northwest zone of Mexico.

Increased capacity of the gas line, Ciudad Pemex—Mexico D.F.—Plans call for construction of nine compressor stations during 1961 and the first part of 1962. These stations will raise the capacity of the line to as much as 500 mmcf/d. It will be equipped



with Ingersoll-Rand reciprocating gas engines and centrifugal compressors, 60,000 hp in total. Operation of these machines will be fully automatic, under micro-wave control from Mexico City.

Expansion of products line, Minatitlán—Salina Cruz—Actual capacity of the products line is 30,000 b/d. Two additional pumping stations will raise capacity to 45,000 b/d. It is possible that construction may start in the middle of 1961.

Trans-Isthmus crude oil line—One oil line Trans-Isthmus will be necessary to supply the Pacific Coast when the new refinery at Mazatlan, Sinaloa, is erected. The characteristics of this line are now under study.

Gas line, Reynosa — Mexicali — Under study at present is the construction of one line 34 inch diameter, and 1,200 miles long from Reynosa to Mexicali, to transport gas from Texas to California and to give natural gas service to northern Mexico and some gas surplus from Mexico could be exported to the United States. This project is made with the cooperation and mutual agreement of Tennessee Gas Transmission Co.

Interconnecting System of Gas lines—Mexico has three big natural gas producing areas: (1) northeast (Reynosa and other fields); (2) center (Poza Rica and Angostura); and (3) South (Jose Colomo and other fields). Proved reserves of natural gas January 1, 1961, in these areas were as follows; northeast, 3.975 trillion cu ft; center 3.032 trillion cu ft; and south, 3.113 trillion cu ft; for a total of 10.12 trillion cut ft.

Rationally, the starting points of all existing gasline systems are Reynosa, Poza Rica and Jose Colomo. The big industrial centers of the country are Mexico City and Monterrey. These conditions predetermined the basic plan for the necessary gaslines. In the northeast there are three lines of 10, 14 and 22 inches diameter from Reynosa to Monterrey; the fields at Poza Rica and Tabasco are connected to Mexico City through two lines of 20 and 24 inch diameter.

At present, the northeast system is being lengthened and branched off toward the west to Monclova, a metallurgical center of importance, and to Saltillo and the Lagunera region (Torreon-Gomez Palacio and Laredo City). The gasline Torreon-Chihuahua is under construction at the present time.

Future plans are for interconnecting the big three producing areas mentioned in order to give more flexibility for the use of available gas reserves in different consumption zones. A line between Poza Rica and Monterrey is the final link to reach this objective.

Future long range schemes will be in accordance with actual field development, the discovery of new fields and market expansion. END

General view of the adsorption plant at Ciudad Pemex. A portion of residential housing is in foreground.

Mexico's refining and petrochemical industry

by Ing. César O. Baptista

Growth in average refinery products yield over the past twenty years has been from 77,690 to 286,070 barrels daily

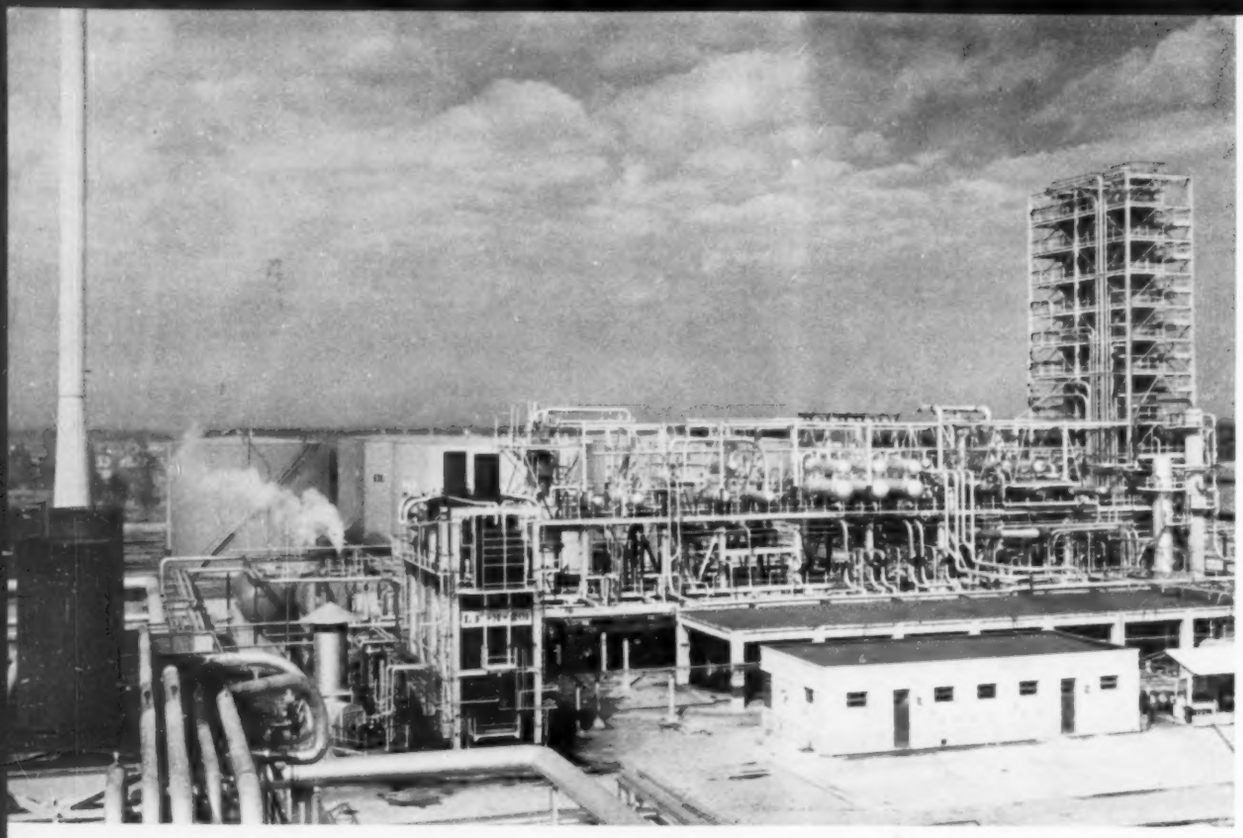
THE STORY of oil refining in Mexico during the last two decades is a story of hard won growth. It is a story of something that has helped the development of the country, but also is a development that has been forced by the growth of the energy requirements of Mexico.

Having worked for the last 19 years for the Mexican oil industry in various positions within its refining organization, I shall try to relate the happenings during this period that have enabled to transform a large collection of out-moded equipment into what may be one of the most modern sets of oil refining facilities of any company in the world.

Crude oil was processed in Mexico in 1942 mainly through topping, light chemical treating of gasolines and distillates, and blending. As most of the crudes that were then produced in our country were quite heavy, the yields of refining operations consisted of small volumes of gasolines and distillates and a very large proportion of residual fuels. Sulfur was an ever-present problem; it still is. Salt in crude oil presented unsurmountable difficulties which were conquered through sheer bulk of maintenance work.

The technical staff of that time was in strict accordance with the above situation; it was very small and had little experience. The Madero refinery in Tampico was then the largest installation; it ran in that year an average of 33,000 b/d through topping and a small gasoline reformer. It also had a wax plant that produced 35 tons of wax daily, and was the most complex unit in the refinery. This refinery was rated then at 52,000 barrels per stream day, capacity which could not be approached because of two reasons: the market for its products was small and the time efficiency of the plants was low from frequent breakdowns.

ING. CESAR O. BAPTISTA was born in Mexico City in 1921. He received his B.S. in chemical engineering, University of Illinois, in 1942, and has worked ever since for Petroleos Mexicanos in various positions. He is today assistant manager of the refining division. During the last four years he has been actively engaged in the planning of the petrochemical developments in Mexico, both state and private. He was a founder and the first president of the Mexican Institute of Chemical Engineers. Has written several papers on the energy problems of Mexico, and related to the industrial development of the country.



Furfural extraction unit at the Salamanca refinery

The technical personnel of the refinery consisted of 15 university trained engineers with an average experience of about four years. It included the general manager of the refinery and the last assistant in the laboratory which was myself.

This group of engineers had been forced to develop under harsh circumstances, without the normal aid that a senior engineer gives a younger one to help him develop. All they had, besides their university training, was the deep feeling that as good Mexicans they had to do their best to keep the installations in satisfactory operation and, at the same time, to improve themselves as fast as possible to be able to solve better, first, the day to day problems that the refinery faces, and second, to prepare themselves to contribute to the fast growth of the industry which was then already felt needed for the immediate future.

As no technical personnel with experience in heavy equipment was available at that time in the country outside the oil industry, a program based on the on-the-job training of young engineers just out of school was started. This program has continued without interruption ever since, and through it, the technical staff of the Mexican refineries has grown from 70 to 700 during this period. At the same time, the average experience has increased from four years to twelve years, and today, every young engineer that starts working has always a senior engineer to teach him and train him so he matures in an easier and more complete way than the small group which had to train by itself twenty years ago.

A larger staff, with all sorts of specialists, has enabled Petróleos Mexicanos to build and place on stream a new large installation every two or three months during the last three years. These installations have been of all types, but they all have been of large size and complexity, and have invariably been placed on stream smoothly.

The contribution of the Mexican universities and technological schools in generating engineers for this program has been a key item in the achievements of our refinery industry.

Petróleos Mexicanos is a state monopoly, and as all monopolies, has several drawbacks that usually tend to slow their growth. At the same time, as monopolies do, it has advantages; perhaps the most important one has been the possibility of planning the growth of an oil industry to supply the energy needs of a whole country in the most efficient manner possible. This advantage was felt clearly a long time ago, and great efforts have been devoted to the planning of its growth to make use of this unusual situation. For example, usually the political pressures within a country would tend towards the creation of small refining entities in each political sub-division, so as to please local governors. Against this, the economical development points towards the creation of very few but large refining centers and wide distribution of products

TABLE I

OIL REFINERY INSTALLATIONS IN MEXICO

All figures in Barrels per Stream Day

	1942	MAY 1961
MEXICO CITY	Topping 19,500	Topping 100,000, vacuum 60,000, catalytic cracking—30,000, Vis-breaking 25,000, catalytic reforming, HF alkilation, butane isomerization, dodecilbenzene, sulphur recovery.
SALAMANCA	Not yet in existence	Topping 40,000, thermal cracking 5,000, vacuum 16,000—catalytic reforming, propane deasphalting, furfural extraction, MEK dewaxing, clay treating, asphalts.
MADERO	Topping 52,000, thermal cracking 4,500, asphalts, wax 35 tons per day	Topping 125,000, vacuum 60,000, catalytic cracking—30,000, Vis-breaking 8,000, catalytic reforming, polymerization, wax, asphalts, sulphur recovery.
BELLAVISTA	Topping 4,000, thermal cracking 800	Has been dismantled.
MATA REDONDA	Topping 10,000, thermal cracking 8,000	Has been dismantled.
ARBOL GRANDE	Topping 17,000, asphalts, lubricants 100, greases 30, waxes 4 tons per day	Topping 5,000, greases 60. Most equipment has already been dismantled.
POZA RICA	Topping 5,000	Topping 15,000, catalytic reforming, gas absorption—200 MM cfd., sulphur recovery 150 tons per day.
REYNOSA	Not yet in existence	Topping 10,000, thermal cracking 2,000, gas absorption 300 MM cfd.
MINATITLAN	Topping 32,000, lubricants 500, greases 30	Topping 75,000, catalytic cracking 18,000, lubricants—1,000, polymerization.
CIUDAD PEMEX	Not yet in existence	Gas absorption 300 MM cfd.

All equipment with the sole exception of Arbol Grande is post-1942 and of thoroughly modern design.

through the use of product pipelines. This second path is the one that has always been followed in Mexico, and has allowed us to refine the Mexican crude oil fully, with complete treating and reprocessing of all intermediate distillates and minor streams, a thing that would have been uneconomical in small operations.

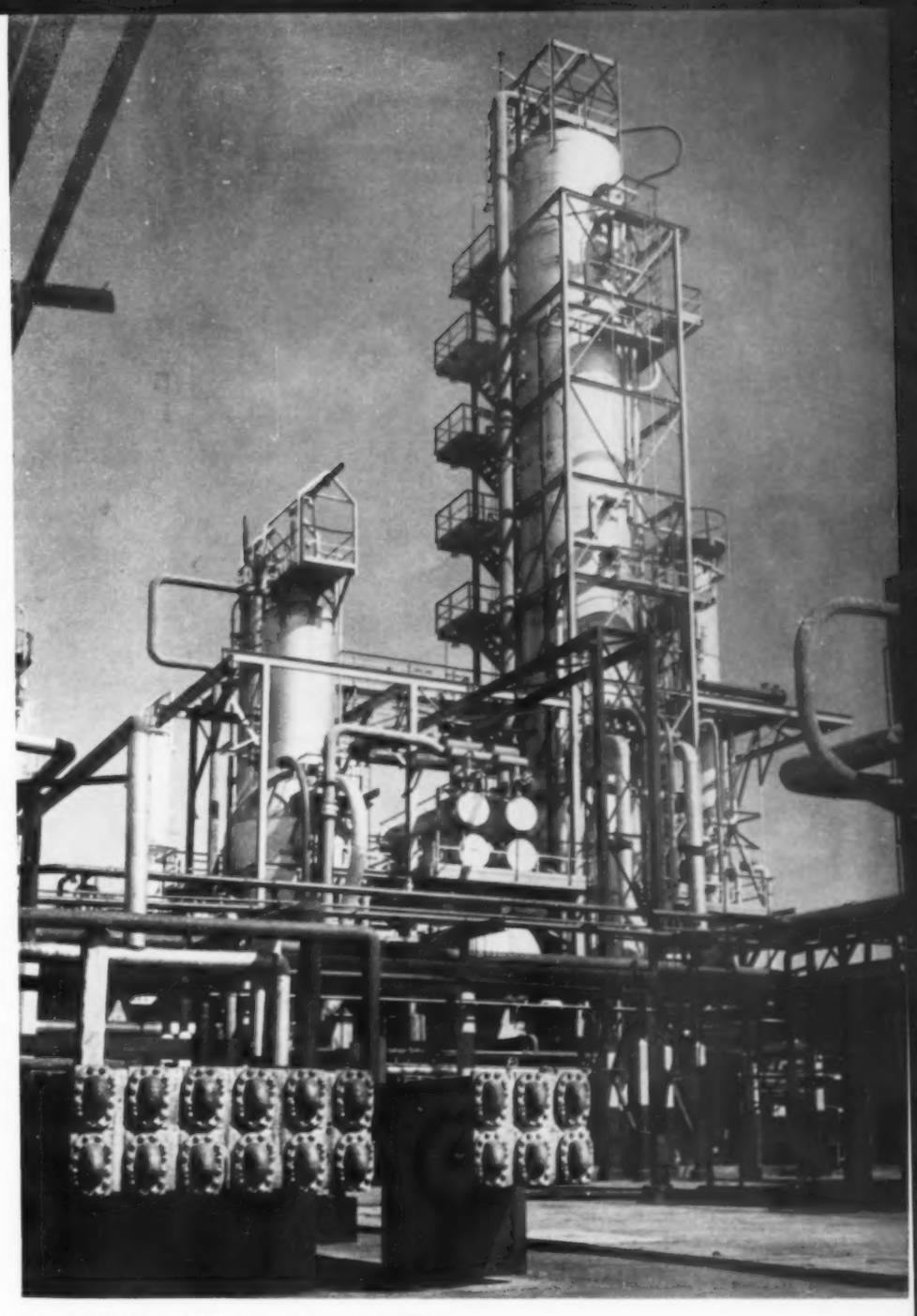
The Mexican government has been very wise in the handling of its oil industry, following always the judgment of its technical management in order that it may grow in an efficient manner, and has always protected it from local political requests which would have, in the long run, placed the small interest on top of the larger national interests. It has always been very zealous in the care of its technical group, recognizing that only through it could a continuous successful growth of the industry be attained.

Most of the group that was responsible for the operation of the refineries and its management 20 years ago, is still working today for the further development of the business. All the top staff has been chosen from the brighter and more experienced men among its career personnel. The history of this stability can successfully compare with what happens in the best managed private companies in Mexico.

The consumption of gasoline in our country has increased six times in the last ten years. The production of gasoline has also increased by the same figure. When you are supplying a market which continually grows, and which doubles every eight years, you have to build the equivalent of everything that existed at any particular time in the next eight years, plus such equipment which is required to substitute obsolescent installations. This means a continuous planning and building program, which is exactly the situation in which we have been in the last two decades.

Furthermore, when you require small amounts of gasoline from large amounts of crude oil, and you only need low octane gasoline, all you have to do is distill the crude. But when your gasoline requirements grow faster than the amount of crude oil you have available and the quality of the required gasoline increases, then you have to start manufacturing gasoline that did not come naturally in the crude. To double the amount of gasoline, you have to treble the needed investment and the amount of equipment to be operated.

When we started growing we had to decide how to grow, and it was decided to do so in large steps and to have faith in the ability to build and operate big units. In a country with little industrial background it is not easy to take this sort of decision, and take it wisely. The proof of whether these decisions have been wise or not is only given by the passing of time. All the installations Petróleos Mexicanos has ever built are today operating satisfactorily and fulfilling the need for which they were planned, and most of them are having throughput quite above rated design capacity.

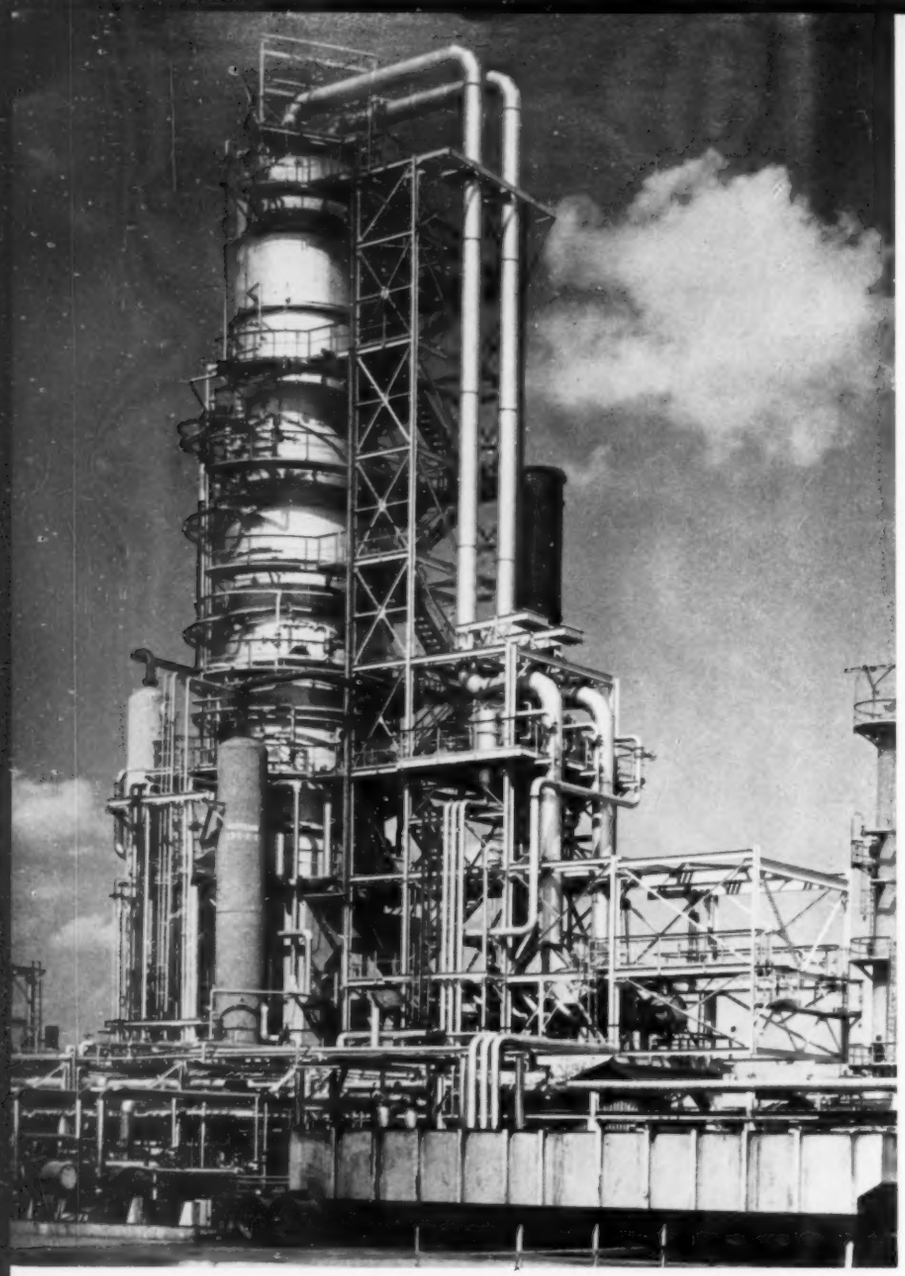


The 100,000 b/d crude distillation unit at Atzcapotzalco

An oil refinery in a large industrial country can rely for needed equipment on the near-by factory or supply house. Mexico has depended for most of its refining equipment on imports from the United States as its local manufacturing facilities are of recent vintage and still incomplete. Even though we are neighbors of the United States, a border exists, and its existence has to be taken into consideration in all requirements of imported equipment. For the sake of purchasing and importing equipment into Mexico, we have estimated the border is equivalent to at least 3,000 miles of additional distance. The above factor has always been remembered, both in our normal operations and in the fulfillment of our development plans.

In recent years, the Mexican government has fostered the installation of industrial facilities to manufacture equipment for the process industries, mainly for the oil refining industry and for the petrochemical industry. The creation of nearby and ever-dependable sources of industrial equipment, the saving of foreign currency, and the creation of additional sources of wealth for the country, have been the guiding forces behind this development. The growth of the general industrial market of Mexico to the point where a very large proportion of Mexican industrial requirements have reached or surpassed a minimum economical manufacturing level has given an additional boost to this trend.

Most of the engineering for our installations has been done by firms from the United States. Since the very beginning it



Pemex's 16,000 b/d vacuum distillation unit at Salamanca

TABLE II
YIELDS OF MEXICAN REFINERIES
All figures in Barrels per Calendar Day

	1942	First Three Months Of 1961
Propane—butane	100	12,700
Gasolines	13,900	82,800
Kerosenes	4,000	32,300
Diesel Oil	4,100	33,200
Lubricants	400	3,000
Waxes	240	900
Greases	50	70
Asphalts	1,600	5,300
Fuel Oil	53,300	115,800

was decided that in choosing our engineering firms we would always keep ourselves within the ones that have best reputation and have already built plants of the type we needed and at least of the size we required. There is no need to say that we always checked whether those plants were in satisfactory operation or not. This reliance on experience and reputation has been a wise decision and we can say today that all the firms that have ever engineered a large installation for us, have kept on working for us through the years and are still working for us today. At the same time, we feel that we have been sound and reasonable customers, and, important for an engineering firm, easy to work with.

Though we have purchased most of our industrial engineering, as mentioned above, we have always done our own construction work and required almost no foreign resident engineers in the job site.

The planning of our growth has always been done by our staff and all the decisions, for better or for worse have been taken by the same group. You can buy specific engineering, but you should never purchase decisions or follow blindly paths which have been proposed by outsiders. When the staff is young it is sometimes very hard to follow its suggestions and very often it is the opposite path which is followed when it has been made by a foreign expert. It is wise to remember the saying that: "very often an expert is just a man from far away."

The government of Mexico has always chosen the Director of Petróleos Mexicanos with extreme care, knowing how essential for the well-being of the country is the healthy development of the oil industry and how important is a wise and firm hand at its helm.

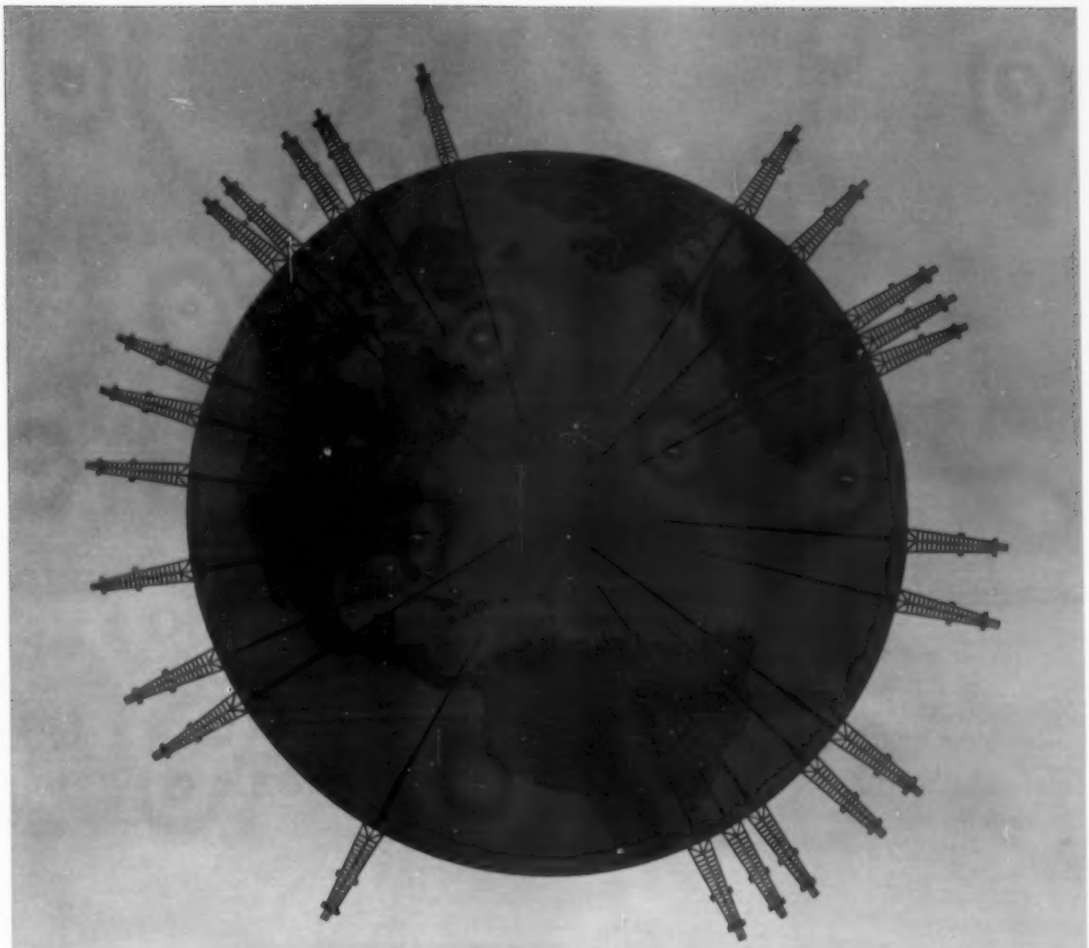
To supply the Mexican needs of petroleum and natural gas products in an efficient and economical manner has always been the main goal of the Mexican oil industry. To supply growth you have to grow, but in order to keep a reasonable level of prices, you have to grow efficiently. The key foundation upon which this efficiency is based has been the use of large equipment; large crude pipelines, large product pipelines, large refineries and a large natural gas network.

In order to grow, but especially to grow by large steps, you need money. It is appropriate to say now that we mention the word money, that Petróleos Mexicanos has always grown through its own resources and that the Federal government has never given any money to the oil industry. Besides this, the Mexican oil-industry pays taxes as any private concern would, and has been, for a long time, the country's largest tax payer; it pays today more than $200,000 US dollars a day to the Federal Treasury.

The prices at which Petróleos Mexicanos has always sold its products have been normally lower than the prices at which they are sold in the countries of low level price schemes. The existence of fuels in abundant supply throughout the country and at very reasonable prices has undoubtedly been a great force behind the general development of Mexico during this period. Industry is growing, agriculture also and is rapidly becoming mechanized; the cities are bigger and more beautiful all the time, and all this is creating, as the back-bone of the country, a new healthy middle class.

When you have to grow, pay taxes, sell all you produce at lower prices than is normally done in the rest of the world, then the growth has to be efficient, or else your required development is impossible. Even if you are efficient, this growing process will always be hard, and to keep at it, through fat and lean years, you have to have fortitude and an emotional goal to achieve, which in our case has been to contribute within our generation to the fast creation of a much better country.

In our development we have always been cautious, and have followed paths that have been proven successful before in other countries. It is very elegant to improve, to be the first one in doing something, or to have the largest installation of some kind; but besides elegant it is very dangerous. We have learned to keep our feet well placed on the ground knowing that every penny we invest has to pay its own way and produce additional money for more



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Developed by Hughes, the new process is producing tool joint to high strength pipe connections capable of withstanding tremendous tension-impact loads. This was proved in a series of drop tests, which, in impact loading, far exceeded the severest conditions encountered in the field. In these tests, the "Flash-Weld" connections were subjected to axial impact energy of more than 400,000 foot pounds. Not a single failure occurred.

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growth. This is the reason why we decided to enter late the field of petrochemicals.

The requirements for more gasoline made us build additional catalytic conversion units which perforce, gave us reasonably large amounts of olefins. The needs of fuel for the industry of Mexico required the construction of a large net of natural gas lines. The production of aromatic gasoline from our Isthmus crudes and our southern absorption plants gave us a big volume of raw materials for a B-T-X plant. These three factors mentioned gave us olefins, ethane, energy and aromatics; they became the building blocks for the Mexican development in the field of petrochemicals.

Great thought was given as to what position the government should take in regard to private capital entering the Mexican field of petrochemicals. The government has a monopoly in the search, production and refining of crude oil and natural gas in Mexico, and suitable rulings were needed to clarify the situation of using refinery streams for the manufacture of petrochemicals and the possibility of participation of private enterprise. Eighteen months ago new regulations that govern this matter were adopted by the Federal government. They clear many uncertainties that existed, because before there were no precedents or legislation to rule on these developments, new to Mexico.

The new regulations establish clearly that the Mexican government, through Petróleos Mexicanos as a regular step of its development, will build and operate the basic industries that take a stream from a refining operation and by converting it once produce a basic petrochemical. This basic product can be sold to private enterprise as its raw material for further petrochemical steps. The very large investments required in the first steps needed to produce a basic raw material shall be made by Petróleos Maxicanos. Unusually the size of these investments is larger than the amounts of capital available in Mexico for industrial enterprises. The subsequent industries are normally of smaller size and larger returns; they are also industries near to the consumer and are the field in which private investors are already starting to operate in Mexico. A partnership of private capital and the Federal government is a path that is being followed, in which the government undertakes the harder and heavier steps and private capital can assume the responsibility of the rest.

When you look back at 20 years of problems and hard work and realize that they forecast another 20 years of the same, you wonder; but when you also feel what this has meant for the general development of the country, you know that all that work has been well spent and the faith has been well placed. At the same time, there is a younger generation with whose ever increasing help the growth process shall be continued for the further improvement of our people. END

TABLE III
PETROCHEMICAL PROGRAM OF MEXICO
April 1961

	Plants in Operation	Location
Ammonia	55,000 tons per year	Cuatitlán and Monclova*
Dodecilbenzene	55,000,000 lbs. per year	Mexico City
Sulphur recovery	51,000 tons per year	Mexico City, Poza Rica and Madero

Plants in Construction With Most of the Equipment Already Purchased

Ethylene	110,000,000 lbs. per year	Mexico City and Minatitlán
Polyethylene	30,000,000 lbs. per year	Mexico City
Ammonia	145,000 tons per year	Minatitlán and Salamanca
Urea	99,000 tons per year	Minatitlán* and Salamanca*
Ammonium nitrate	75,000 tons per year	Minatitlán* and Monclova*
Benzine	124,000 tons per year	Minatitlán
Toluene	11,000 tons per year	Minatitlán
Orthoxylene	14,000 tons per year	Minatitlán
Meta and Para xylenes	45,000 tons per year	Minatitlán
Ethyl bencene	19,000 tons per year	Minatitlán
Carbon black	33,000,000 lbs. per year	Salamanca*

Plants to be Started in an Immediate Future

Tetraethyl lead	16,500 tons per year**
Styrene	16,500 tons per year
Butadiene	33,000 tons per year
Synthetic rubber	44,000 tons per year**
Vinyl chloride monomer	11,000 tons per year
Acetaldehyde	24,000 tons per year
Nylon	11,000 tons per year*
Phenol	5,500 tons per year*

* Plants so marked are privately owned.
** Plants of mixed private and State capital.
Unmarked plants are State-owned, usually through Petróleos Mexicanos.

General view of the Atzcapotzalco refinery

An extension of the gas pipeline from Monterrey to Torreon

Coordinating Pemex

by Rafael Ortiz Mena
General Coordinator, Petroleos Mexicanos

Constant careful planning is needed in a situation where 92% of the nation's energy requirements are met by oil and gas

THE MOST EFFECTIVE stimulus for the economy of Mexico is the wide distribution and full supply of petroleum products. The country relies more each day on oil and gas to satisfy its needs for energy. During 1930, petroleum and natural gas supplied 64.5% of the energy used in the country. By 1940 that proportion had grown to 73.2%, by 1950 to 81.9%, and by 1959 the surprising share of 92% of Mexican energy needs were being met by oil and gas.

Add to this large percentage share in Mexico's energy market the fact that the demand for petroleum and gas is inelastic, and thus not only is the best stimulus to use the broad availability of hydrocarbons where and when they are needed, but furthermore if these products are not refined within the country they must be imported.

The Mexican petroleum industry has been characterized by an accelerating and continuous growth. From 1938 through 1948 demand for petroleum products grew at the rate of 8.7% yearly on the average and from 1959 to 1958 demand grew at an average of 7.9% yearly. From 1948 to 1958 the population of Mexico increased to 32 million from 24.1 million inhabitants, an annual increase of about 2.9% yearly; the demand for petroleum thus grew at 2.7 times as fast as the population.

The consumption of hydrocarbons within the country rose from 2.15 b/d per inhabitant in 1948 to 3.45 barrels daily per person in 1958. The 42.5 million people who will populate Mexico in 1968 will, it is hoped, each utilize 4.27 barrels of hydrocarbons per year each, thus pushing demand to somewhere in the neighborhood of 500,000 b/d or an increase annually of 6.5% during that era, which is slightly less than the annual increase during the previous periods cited.

Pemex programs have been based on the

HIGH FLYER IN OIL AND STEEL

Pemex chief, Pascual Gutierrez Roldan, formerly was head of Altos Hornos, the Mexican government's agency for steel production. He spent eight years with that company and raised steel production to the point where Mexico now produces her own line pipe using Mexican steel, the only country in Latin America to do so outside of Argentina. Since his debut with Pemex about two years ago he has consolidated the company's payments to the government into one, kept the labor peace and boosted company production and drilling last year to new heights. An avid pilot, he flies his own and company airplanes for sport.

From left to right: Milton Cross, the "Voice of Opera" – and announcer for Texaco's Metropolitan Opera Broadcasts; Chet Huntley, famous newscaster of the Texaco Huntley-Brinkley Report; Marion J. Epley, Jr., Senior Vice President of Texaco Inc., at the luncheon meeting of the Radio and Television Executives Society of New York, April 18, 1961—when presentations were made of the highly coveted Peabody Awards.

Texaco News and Opera programs win Peabody Awards!

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Chet Huntley, shown above, accepts the Peabody Award *for the best television news program of 1960.* Mr. Epley of Texaco accepts the Peabody Award for the Texaco-Metropolitan Opera Radio Network – *for outstanding public service – 1960.*

Administered by the University of Georgia, the Peabody Awards are widely considered the most significant of all citations for excellence in the broadcasting industry.

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need for complete supply of hydrocarbons to the country, satisfying all its demand with national oil without relying on imports which could be prejudicial to the national welfare.

This works program is not only a goal; it is only a step in a long-term program which foresees the future need for hydrocarbons and the best methods of supplying them.

More concretely, during the next six to 10 years the total demand for hydrocarbons in the country will continue to grow at about 6.5% yearly, which means 330,000 b/d of products in 1961 will grow to approximately 500,000 b/d in 1968.

Demand will be met by the production of crude oil, as well as by natural gas. The exploration of national territory has brought about the discovery of abundant resources for this task, both of petroleum and natural gas.

The country has continued to consume predominantly petroleum, crude or its derivatives, and this consumption of petroleum by itself has increased considerably the reserves of gas. It has become urgent to shift part of this demand into gas, thus diminishing the demand for oil. In recent years there has therefore been considerable attention devoted to construction of gas lines which improve the utilization of hydrocarbon resources. Gas use will replace principally the use of fuel oils, but the liquid products left in the absorption plants in the field will diminish also the amount of refined products which also would have otherwise to be extracted from crude petroleum. In the accompanying table, there is shown the principal trends in consumption of principal petroleum products in Mexico for the 1950-1968 period, given in barrels daily.

MEXICO—Consumption Forecast
(Barrels daily)

	1968	1950	% Increase
LPGas	41,000	3,000	13.7
Gasoline	128,000	37,500	3.4
Kerosine	56,000	12,800	4.4
Gas Oil	67,000	9,800	6.8
Fuel Oil	120,000	81,000	1.5

The Mexican petroleum industry has its production, transportation, refining and distribution installations grouped in four large systems which service the diverse regional needs of the country. Given the topography of the country, utilization of tankers is important but limited. Oil, gas and products lines are predominant and, of course, the most economical system for transportation of hydrocarbons in Mexico.

Of the four large systems which service regional demand refineries in the Federal District, Salamanca and Poza Rica, service the central part of the Republic. Another refinery, in Tampico, as well as an adsorption plant and refinery in Reynosa, service the northern part of the country, with a products line which goes from Tampico to Monterrey and to Torreo, and which now is being extended to Chihuahua. Finally, a refinery in Minatitlan, along with an adsorption plant already in operation in Ciudad Pemex, and another in construction at La Venta, also in Tabasco State, service the southeast zone and by means of a products pipeline which crosses the Isthmus of Tehuantepec, from the Gulf of Mexico to the Pacific Ocean makes products available in Salina Cruz for the supply of the Pacific coastal zone.

Comparison of demand figures since 1938 and projection of them through 1968 establishes the following significant changes:

MEXICO—Consumption by Product
(Percentage—Composition)

Product	1938	1948	1958	1968
LP Gas	0.08	1.55	4.35	10.0
Gasoline	14.70	21.41	26.23	27.2
Kerosine	3.75	6.62	10.24	12.4
Diesel	4.65	5.79	10.70	17.3
Total Oil Use (Incl. Gas)	73.10	61.27	44.41	30.2
Miscellaneous	3.72	3.36	4.07	2.9
Total	100.00	100.00	100.00	100.0

As may be seen, the most important refining process in Mexico is catalytic cracking. In effect, it is not possible to obtain from petroleum more products or derivatives than those with which the crude was endowed originally unless this process of decomposition and synthesis of natural derivatives is used. Catalytic cracking permits the transformation of heavy products or residuals to light products or intermediate products which fuel the most advance forms of energy, the demand for which is growing most rapidly and in proportions which are not encountered in hydrocarbons in their natural form.

The basic program that Petroleos Mexicanos has followed has been that of the incorporation of catalytic cracking processes in the various refining centers of the Republic, which permits balances between demand and productive capacity of the various centers of refining. These refining centers work therefore with their crude distillation and crude cracking capacity to convert heavy products to intermediate or light products which are required by demand.

One factor that is very important at present is the problem of supply of the Pacific coast and the increase in demand in the central zone of the country.

The Pacific Coast demand has increased already to a level of product consumption which makes it necessary to establish refining centers in the area. There is planned an integrated refining operation in the Pacific Coast area, with two centers of operation. One of them located in Mazatlan and the other in Rosario. The operation of these two centers shows several special characteristics. In Rosario there is a strong demand for fuel in the thermoelectric plant, which it is planned to meet with petroleum coke. In Mazatlan a complete refinery is planned, with facilities for catalytic cracking of residuals, high production of intermediate distillates and a minimum production of residual fuel oils.

The coke operation at Rosario will receive as fuel residual products from any or all of existing refineries, including the new operation at Mazatlan, with which there is planned an exchange of gas oil for heavy residual.

Once refining operations are installed in the Pacific, the refining center of Minatitlan, including the absorption plant at Ciudad Pemex and at La Venta, will begin supplying the central zone of the country through a products line from Minatitlan to the Federal District, the construction of which will begin in the near future.

Catalytic cracking being the most useful refining process for obtaining a balance between production and demand in Mexico, it has become necessary to consider a petrochemical program that will utilize the olefins and other materials produced.

For this reason, Petroleos Mexicanos followed a program of manufacture of primary or basic petrochemical products or feedstocks which will serve for its later use. At present, there are two anhydrous ammonia plants under construction with a capacity of 200 tons daily, located near the Minatitlan refinery and the other at the Salamanca refinery. The production of these two plants is converted into solid fertilizers, urea, ammonium nitrate and ammonium phosphate, by two private firms.

In the Minatitlan refinery there is being installed the equipment necessary for the production of the following aromatics: benzol, toluene, orthoxylene, ethylbenzene, cyclohexane, and a mixture of meta and para xylenes.

In the Federal District refinery (Salamanca) there is presently being installed a high pressure polyethylene plant to utilize the ethylene produced in cracking.

In the Cuidad Madero refinery is being installed a plant to convert the ethylbenzene produced in Minatitlan, to styrene.

In addition, there is being constructed a plant to produce 30,000 tons yearly of butadiene from the butylenes from the cracking process. Butadiene as well as styrene will be produced also at Tampico.

In the Federal District refinery there is already a plant in operation for the production of dodecylbenzene and there is now being completed the installation of a similar plant in the Cuidad Madero refinery.

The program envisions as well the production of ethyl chloride, dichloro ethylene, bromo and dibromo ethylene, elemental sodium, vinyl chloride, acetaldyde and tetraethyl lead. All this industrial complex, in the Coatzacoalcos Zone, near to the Minatitlan refinery, with the objective of utilizing those natural resources of this one and its strategic location.

In this zone there is also some natural gas, abundant resources of ethane, some very potent salt domes, sulfur, a great amount of water and excellent means of communication.

This petrochemical program will continue to expand as demand is established for primary products by private groups which become interested in the utilization of these products. END

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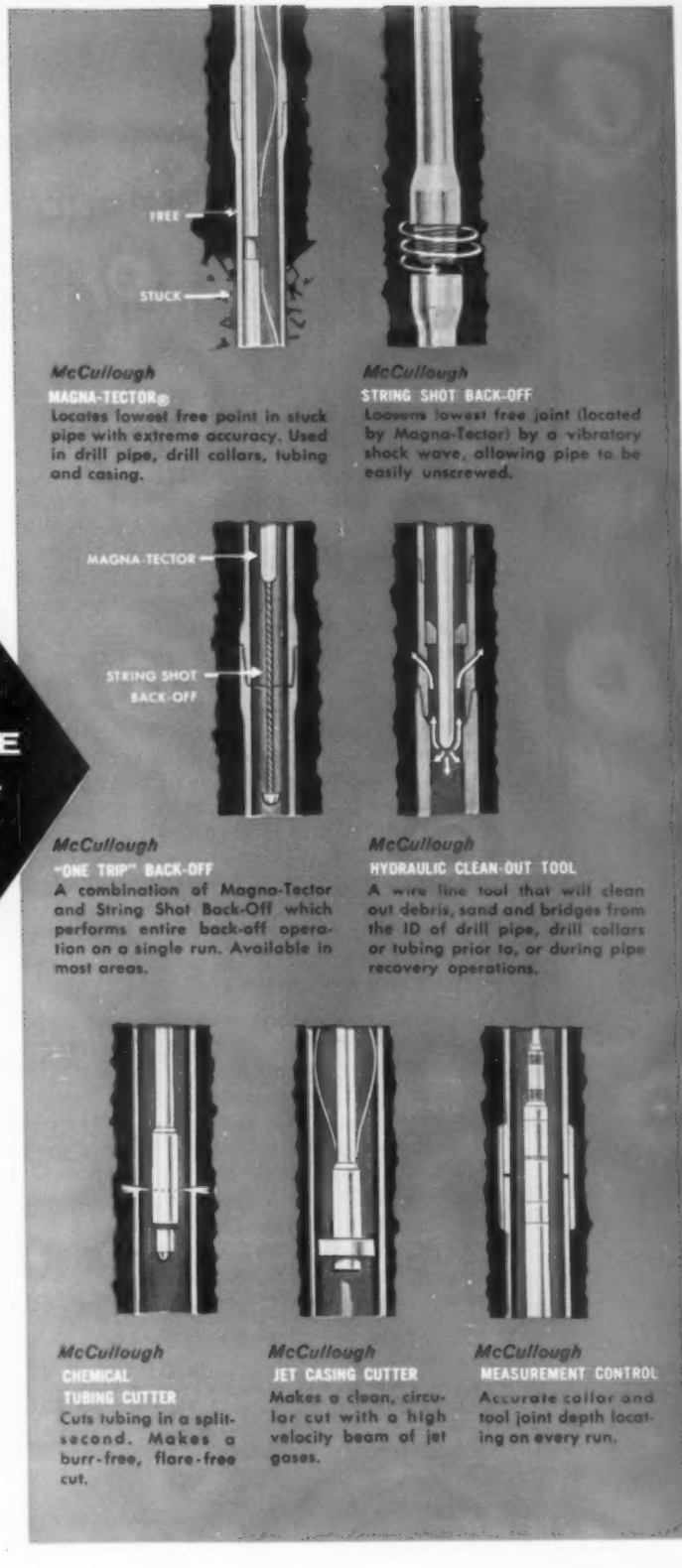

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Report for 1960

The British Petroleum Company

Extracts from annual statement to stockholders by the

HON. MAURICE BRIDGEMAN, *Chairman*

World demand for oil outside the Communist bloc in 1960 rose by about 1,260,000 barrels a day or 7.5%. In the US demand rose by only 260,000 b/d or 3%, whereas in Western Europe the increase was 580,000 b/d or 17%. This rising demand has been accompanied by greatly increased competitive activity, due primarily to a "surplus" of oil. There has in fact been a potential surplus of production for many years. What has occurred recently is that those who have developed new sources of oil, anxious to recover their investment, have stimulated production to a rate higher than the market can readily absorb and in so doing compete for outlets held by established producers. It is this, coinciding with the restriction of crude oil imports into the US, and an increase from 340,000 b/d to 450,000 b/d in 1960 of Soviet zone oil sold in the free world at low prices, which has created a "surplus" position.

It is often asserted that seven or eight large companies are able to dominate the international oil business and form a club to which no further members can be elected. This is very far from the truth. The larger companies compete very actively with each other as well as with the so-called independents, and have achieved their positions slowly and laboriously, by keeping in the forefront of technical development, by charging reasonable prices to consumers, and by paying a fair rent to the landlord, rather than by taking advantage of short-term opportunities.

The statement that a fair rent is paid to the landlord is often challenged, for there is still a widespread belief that, in spite of the "50/50" agreements for sharing the profit arising from the production operation, the oil companies are depriving the producing countries of a fair share of the profits. I would like by reference to our results, to place this suggestion in a more accurate perspective.

Payments to the Middle Eastern countries under the "50/50" agreements are based on posted crude oil prices, and the total sum included in our 1960 accounts for such payments was $358,400,000. This figure is substantially greater than that for 1959, despite the slight reduction last August in Middle East posted prices.

BP Group profits, which represent the net result of all the operations involved, and not merely those related to production, last year amounted to just over $174,000,000.

It is not possible for us to bring to the consumer the ever greater quantities of oil which are required unless we provide not only the production facilities, but also the necessary tankers, pipelines, refineries, and marketing installations. But although the increase in revenues of the producing countries depends on the availability of all these facilities on a steadily mounting scale, the Governments concerned are not obliged to spend on the provision of such facilities any of the money they receive from oil royalties

THE BRITISH PETROLEUM COMPANY

and taxes, and they are, therefore, free to direct their revenues towards those projects which are vital to their economic development.

Furthermore, to the capital required for the development of market outlets must be added the capital needed to search for additional sources of supply, for it would not be prudent to cease exploration while market requirements are increasing. Capital expenditures of the BP Group for the period 1958-1960 totaled $1,092,000,000. With the additional need for increased working capital, the money BP has had to find over the period was not less than $1,176,000,000. As a result, there has been a large gap between the amount we have had to find for capital expenditure and the amount we have been able to accumulate out of each year's operations. The only way to bridge this gap is to borrow from the world's capital markets. Our Group is in no way unique in having to find some of the money required for capital expenditure by borrowing from third parties.

The oil industry's part of the "50/50" bargain thus involves not only the acceptance of the risks—which are very considerable—but also the responsibility for providing all the capital for the refining, transport and marketing, as well as for the actual production of the oil. I do not think this can reasonably be described as a bad bargain for the people of the producing countries.

The extent to which the industry must rely on the capital markets for further expansion makes it essential that we should try to maintain reasonable and reasonably stable price levels. For if prices fall, the proportion of the sum the industry must obtain from the money markets will increase. It is consequently a cause for concern that, in attempting to maintain these price levels, companies such as ours, which operate on commercial principles, should have to meet severe competition from those which can rely on preferential positions and financial support from their governments. Such competition has now to be faced not only from behind the Iron Curtain, but also from other directions.

The maintenance of a reasonable stability of prices is rendered more difficult by another current tendency. In a period of over-supply it is not difficult for independent operators to buy relatively small quantities of oil products at very favorable rates and sell them cheaper than the established companies in limited areas which are easy to supply. These operators are able to take advantage of short-term considerations, including abnormally low freight rates. They are not concerned with longer term responsibilities to maintain supplies throughout the world, often in difficult markets. They do not have to carry the expenses of prospecting, transportation, refining and research; nor need they include in their prices any element to provide the facilities necessary to meet a growing demand.

As to the future, I hesitate to make any positive prediction, optimistic or otherwise. At the same time, I think I am safe in saying that BP is well equipped to play its part in meeting the demand for oil, which can be expected to continue increasing throughout the free world.

FINANCIAL HIGHLIGHTS

All figures converted from sterling at $2.80 to the pound.

GROUP SALES PROCEEDS in 1960 totaled $2,623,737,000 as against $2,374,769,000 in 1959. Sales of crude oil and refined products were at an all-time high of 547 million barrels, up nearly 15% from 1959.

GROUP INCOME BEFORE TAXATION amounted to $404,536,000, an increase of $37,854,000 over the previous year's total of $366,682,000, reflecting the gain in tonnage sales.

CONSOLIDATED NET INCOME was $168,955,000 compared with $174,017,000 in the previous year. The decline was due largely to a rise of $41,160,000 in the charge for taxation.

DIVIDENDS for 1960 per £1 ordinary stock unit will total two shillings and four pence (33¢), free of U.K. income tax, upon payment of the final recommended dividend of one shilling and eight pence (23¢).

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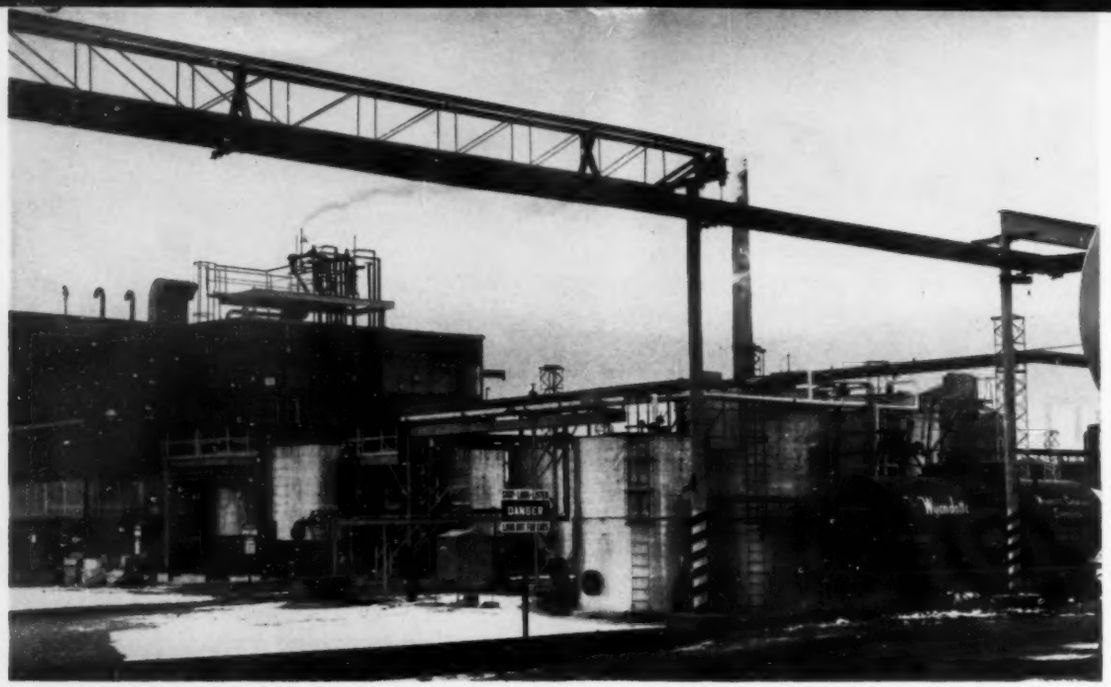

Part of Wyandotte Chemical's plant for making hydroxyl-bearing polyethers from propylene oxide

New markets revive petrochemical propylene oxide and glycol

by Peter W. Sherwood*

In a period when the upward trend in the sale of many petrochemicals appears to have diminished considerably, propylene oxide offers a remarkably bright outlook for expansion. Output rose from 105 million lb in 1957 to 288 million lb in 1959, is expected to spurt to reach 300 million lb in 1960, and continue at a growth rate of 5% per year.

Some of 1959's remarkable upsurge seems to be due to inventory adjustments, but much of it represents a real increase in consumption. This sudden expansion in consumption represents a complete reversal in the demand trend for propylene oxide and its main derivative, propylene glycol. Thus, output of the glycol in 1956 was 81 million lb, about the same as it had been in 1948 and below the peak of previous 90.6 million lb produced in 1952.

Reason for the marked decline in propylene oxide demand during the early 1950's was the loss of antifreeze markets to ethylene glycol when supply of the latter commodity became adequate. Recovery of propylene oxide markets since then may be credited to the rapid development of two new end-use areas: (1) polyester resins, hydraulic fluids, fatty acid esters and a number of lesser products based on propylene glycol, and (2) polyethers (principally polyurethanes), based on propylene oxide—a particularly rapid growth field.

In the absence of reliable market data, estimates of end-use volumes for propylene oxide vary considerably, with the following indicated range, in million lb, for 1959:

	Estimate[1]	Estimate[2]
Propylene glycol	130	150
Polyethers (urethanes)	45	52
Polypropylene glycols	20	23
Miscellaneous (isopropylamines, surfactants, etc.	37	
	232	225

The market leader is clearly propylene glycol, which accounts for somewhat more than 55% of propylene oxide demand. This product finds its main market (40-45 million lb in 1959) in the production of polyesters. Second in importance is use in cellophane (18 million lb). The balance of the market is chiefly made up of production of plasticizers, brake fluids, and sale of propylene glycol as such.

For the short-range outlook, biggest single expansion in propylene oxide demand will undoubtedly be related to the growth of polyethers and, to a lesser extent, to polyesters. Polyethers, or more particularly polyurethanes, are produced among others, by the reaction of diols with toluene diisocyanate, while polyesters are formed by the condensation of glycols with acid anhydrides. The choice of glycol depends on desired end use properties. For example, propylene glycol fumarate (a polyester resin) tends to be less crystalline and more soluble in styrene than their ethylene glycol counterparts.

Although the specific application of propylene glycol to polyester formation takes up a relatively small segment of the polyester resin field, propylene oxide is one of the major raw materials in polyurethanes production (some 95% of today's polyurethanes are of polyether type). In this function, propylene oxide therefore participates in a field which has shown a remarkable growth history since polyurethanes were first offered commercially in 1955.

Of the two main lines of polyurethanes—flexible foams and rigid foams—propylene oxide-consuming flexible foams are by far the more important. Output of this type was 35 million lb in 1958 and 93 million lb in 1960 (typical propylene oxide consumption is about 0.6-0.7 lb/lb polyurethane resin).

The USA outlook for flexible polyure-

*Chemical Engineer, White Plains, N. Y.

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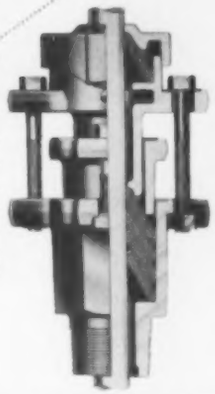

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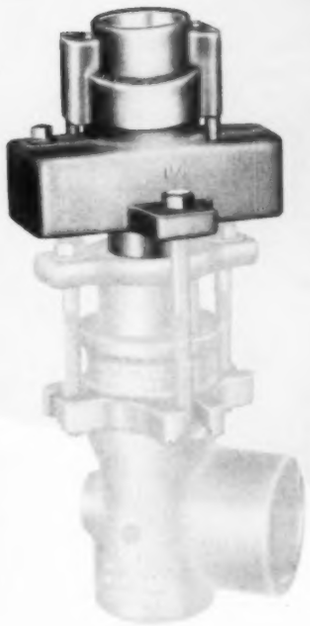

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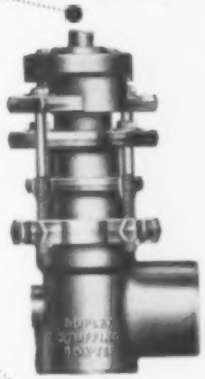

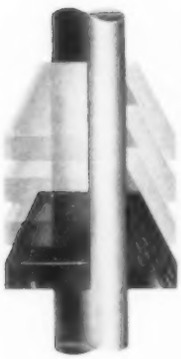

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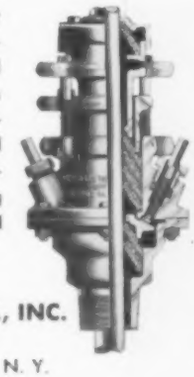

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Wyandotte Chemical Co.'s plant for the production of propylene glycol by the chlorohydrination route. Photo courtesy Wyandotte Chemical Co.

thane foam output in 1964 has been estimated at 185 million lb. Biggest consumer (about 50% in 1959) is the furniture industry (seat cushioning, back arm padding). Next in line are automotive uses (seats, pads, sun shields, instrument panel padding) and uses in bedding, notably in mattresses.

Long-range, propylene oxide offers growth potential which goes beyond the foregoing established consumer fields. For specialty use, propylene oxide serves in lieu of ethylene oxide in the production of a line of nonionic surfactants. New types of propylene oxide derivatives are being developed for use in polyurethanes, among them Union Carbide's propylene oxide-hexanetriol adducts and Dow Chemical Co.'s trihydroxy polypropylene glycols. Considerable interest attaches to stereospecific polymers of propylene oxide. An isotactic group which shows good crystallinity and high molecular weight (up to 500,000) and is being considered for production of fibers and plastics; and an atactic group which is being evaluated for use in improved foam rubbers.

Despite the favorable sales outlook for propylene oxide, it will be some time before new production capacity is actually needed. Present propylene oxide plants, operated by five companies (Dow, Union Carbide, Olin Mathieson, Jefferson Chemical, and Wyandotte Chemicals) at eight locations have a combined rated capacity of 365 million lb/yr. All of these facilities are based on the chlorohydrin route from propylene to propylene oxide. In addition, direct oxidation is the source of about 8 million lb/yr. propylene oxide—as a by-product in Celanese Corp.'s vaporphase oxidation plant at Bishop, Texas.

By contrast, *ethylene* oxide production by direct oxidation has, in recent years, overtaken the older chlorohydrin route in commercial importance, a trend which still continues. As a result, additional chlorohydrin facilities previously used for ethylene oxide manufacture become available for propylene oxide production, thus add to total capacity of the higher epoxide.

Although propylene oxide manufacture via chlorohydrination bears distinct similarity to the corresponding production of ethylene oxide, marked differences exist also. These variations are due principally to differences in the relative reaction rates in the conversion steps, as well as differences in the physical properties of the various compounds involved.

As for direct oxidation processes, despite considerable research effort, none has been reported which appears close to commercialization. (However, trade sources suggest that two companies are approaching the goal of such a process). The vapor-phase air oxidation over silver catalyst, by which ethylene is converted to ethylene oxide in approximately 65% yield, results almost solely in carbon dioxide and water formation when applied to propylene. Non-catalytic vaporphase oxidation of butane/propane mixtures, which is practiced by Celanese at Bishop, Texas, does result in the formation of some 8 million lb/yr propylene oxide along with other oxygenated aliphates; the product is consumed captively for conversion to propylene glycol. Finally, the vaporphase air oxidation of propylene over copper-based catalysts, as practiced by Shell at Norco, La., leads almost exclusively to acrolein (plus complete combustion products).

Thus, for the partial oxidation of propylene to its oxide, a different line of investigation has been taken, namely catalytic oxidation in the liquid phase under pressure and this approach permits propylene oxide yield of the order of 50%.

Despite the importance of propylene oxide and glycol, surprisingly little information has been published on methods involved in their manufacture. This article will deal with this subject from two points of view: (1) synthesis of propylene oxide and its glycol by the commercial chlorohydrination route, and (2) developmental processes for the direct epoxidation of propylene to its oxide.

The Chlorohydrination Route

Underlying the commercial synthesis of propylene oxide and its glycol is the series of reactions shown in Fig. 1.

The chlorohydrination reaction (Equation 1a), leads to a mixture of the two isomeric propylene chlorohydrins. According to Smith et al.,[3] 95% of the product is the alphahalogen compound; the remainder is the betachloro isomer. Both forms are subsequently converted to propylene oxide.

Chlorohydrination is carried out in the liquid phase by contacting gaseous propylene with chlorine-bearing water. The reaction is accompanied by the formation of significant amounts of propylene dichloride and β, β'-dichloro diisopropyl ether. In order to obtain maximum yield of propylene chlorohydrin, therefore, it is essential that conditions be adjusted to favor contact between propylene and hypochlorous acid (i.e. dissolved chlorine). Direct contact between propylene and elemental chlorine results in the formation of propylene dichloride and must, therefore, be minimized.

This effect is emphasized by recent work due to Etlis and Grobov,[4] who investigated the effect of chlorine:propylene ratio and flow rate on propylene chlorohydrin yield. At otherwise comparable conditions (35-43 C, 6% chlorohydrin concentration in reactor), the authors report the following effect:

Chlorine:Propylene	Yield of PrOHCl, % on chlorine
1:1	63
1:2	86
1:2.5	91
1:3.2	93.5
1:4.1	99–100

In addition to the three products mentioned above, these authors also noted formation of a small amount (0.5-1.0%) of chloroacetone, probably due to the oxidation of 1-chloropropanol-2.

It is evident that a high propylene-chlorine ratio at all points of the reactor system is crucial to the attainment of high yield. The problem is dealt with in two ways: use of excess hydrocarbon, and design of the chlorohydrination reactor.

Because propylene is used in about 25-30% excess, the gas leaving the chlorohydrination reactor contains unconverted propylene which may be utilized by recycling. The extent of such recirculation is limited, on economic grounds, by the concentration of diluent in the converter gas. For this reason, the use of concentrated propylene per-

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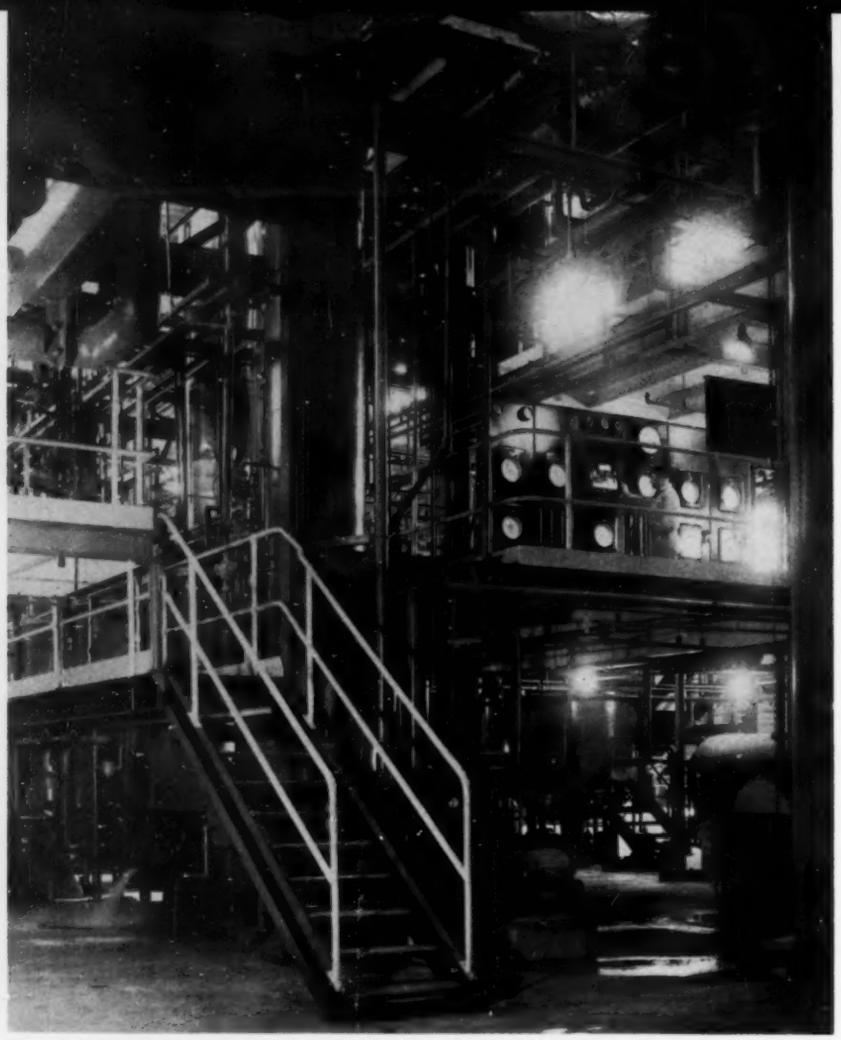


Interior of propylene oxide manufacturing facilities operated by Dow Chemical. Photo courtesy Dow Chemical Co.

mits the highest yield of propylene oxide. However, feedstreams containing as little as 30-40% propylene have been used commercially. Furthermore, propylene and ethylene chlorohydrins can be and have been produced simultaneously from a feedstream containing both olefins.

Key to successful reactor design is twofold: (1) avoidance of direct contact between propylene and elemental chlorine, and (2) maintenance of a low chlorine:propylene ratio at all points in the system. Three different designs are known to be in use for production of the lower olefin chlorohydrins.

The most obvious method is to separate the chlorine-dissolving vessel from the reactor proper. Hypochlorous acid solution is generated in the first vessel by passing chlorine into water (as is usually the case), into sodium hypochlorite,[5] or into sulfuric acid.[6] The resulting solution is fed to the bottom of the chlorohydrin reactor where it is joined by propylene.

A modification of this approach combines the dissolution and reaction functions into a single unit. In this instance, the converter is a vertical column. The tower consists of four sections, of which the upper three are packed with Raschig rings while the bottom section is kept free of obstructions. Water and chlorine are fed into the bottom of the tower while propylene is introduced at a higher level. The two points of entry are at sufficient distance to permit complete chlorine dissolution in water before contact is made with propylene.

An alternative reactor design, which has attained industrial importance, embodies the principle of recycling the aqueous medium. Typically, a recycle reactor consists of a main column and a side leg which are joined into a single loop. Both legs of the loop are filled with reaction liquor. Space is provided atop the main column to separate tail gas from the liquid reaction medium.

In this system, propylene is introduced into the bottom of the main column. As it rises through the liquor, it is partly reacted. The remaining gas phase provides a gas lift, carrying liquid with it to the disengagement space at the column's top.

A portion of the reactor liquid is withdrawn from the phase separator but the bulk is recirculated to the tower bottom via the side leg in which it is joined by chlorine. The important effect of such a recirculation system is that a high local chlorine concentration can never occur. As a result, yield tends to be higher than is obtainable in single-pass reactors.

Relative performance in these two types of reactor has been investigated in the laboratory by Ferrero et al.[7] In this investigation, chlorohydrination in a recycle reactor yielded 87.5% propylene chlorohydrin, 11.0% propylene dichloride, and 1.5% chloroisopropyl ether. At otherwise comparable conditions in a single-pass converter, propylene chlorohydrin yield was only 69.2% on converted propylene.

This yield advantage appears to be confined to specific operating conditions, and particularly to the concentration of propylene chlorohydrin in the reaction liquor. Ferrero[7] shows nearly linear decline in propylene chlorohydrin yield from 98% to 75-84% as propylene chlorohydrin concentration in the reactor liquid is raised from nil to 100 grams/liter. In parallel studies concerning ethylene chlorohydrin production, Domask and Kobe[8] obtained essentially the same yield (88%) until product concentration in the reactor medium reached 6.5%. Above this point, yield declined but the decline was less pronounced in reactors with recycle operation. In the case of propylene chlorohydrin production, this distinction is even more pronounced.

Concentration of free chlorine in the system must be low to avoid chlorination side reaction. Etlis and Grobov[4] have demonstrated that increasing rate of chlorine flow in a particular laboratory set-up depresses the propylene chlorohydrin:HCl ratio (i.e. the useful yield) significantly. Similarly, Ferrero calls for a free chlorine concentration below 0.5 g/liter.

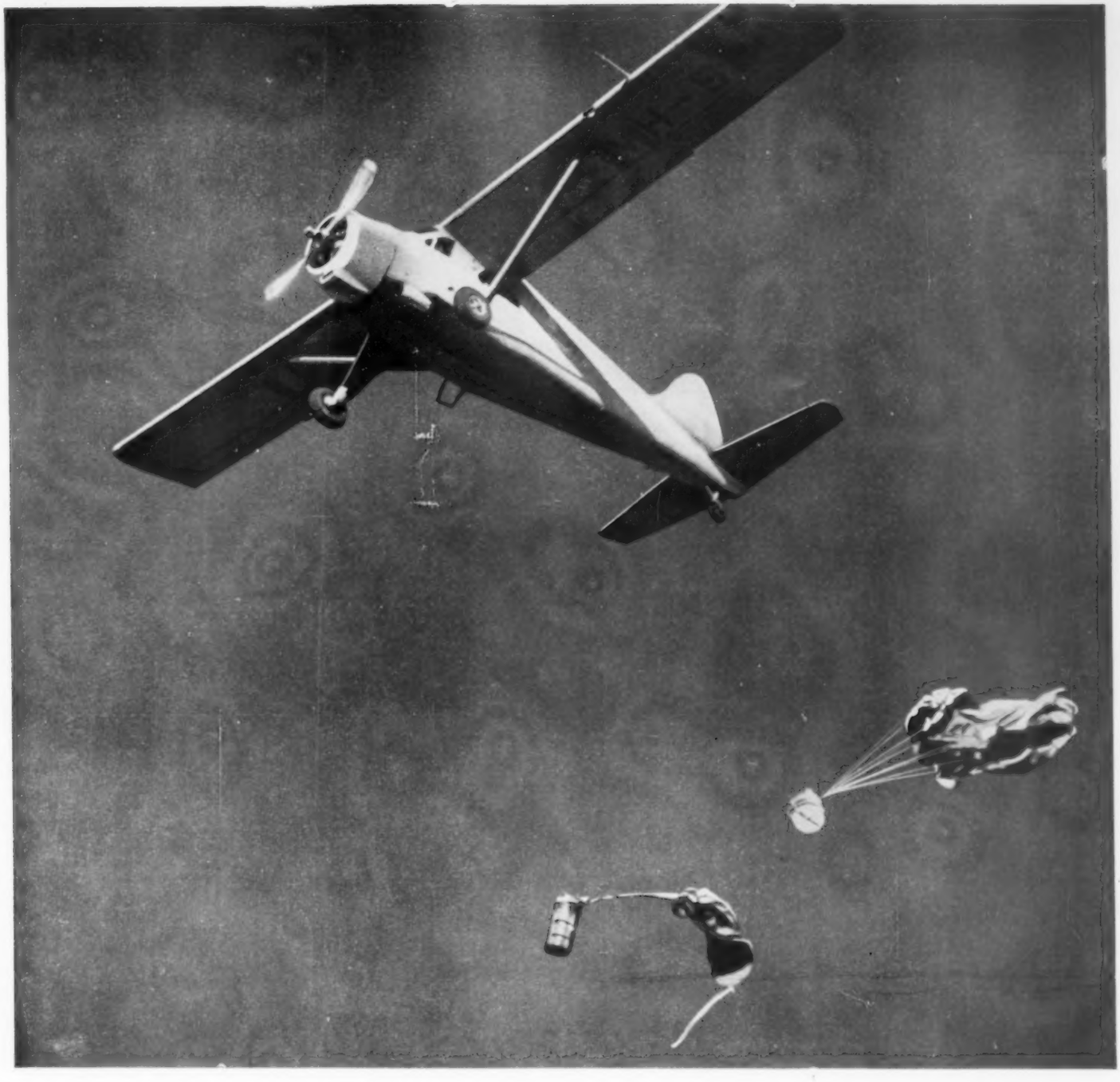
The chlorohydrination reaction is favored by low temperature. It should clearly be held below 50 C. By reducing temperature from 45 to 35 C, yield can be raised by 2-5% (depending on other operating conditions).

Even under the best commercially acceptable operating conditions, formation of some propylene dichloride is unavoidable. If this compound is permitted to build up in the reaction space, it will form an organic phase which will favor production of more propylene dichloride. This occurrence of a second phase can be essentially avoided by using sufficiently dilute feed propylene stream. The inert gas will then strip propylene dichloride from the system as it is formed.

Saponification to Propylene Oxide

Propylene chlorohydrin may be readily hydrolyzed to propylene glycol or oxide by the action of alkali at elevated temperature, (Equation 1b). The use of strong alkali, such as sodium hydroxide, favors conversion to the slycol, while weaker alkalis (lime) result in propylene oxide production. The latter approach is employed industrially because of lower raw materials cost, higher overall yield, and less complex purification problems.

The reaction and its execution parallels methods employed in the manufacture of ethylene oxide. A significant point of difference is, however, the rate of reaction, which is 10-12 times greater in the case of the propylene compound. Indeed, this difference in reaction rate is the basis of a process[9] for the separation of propylene (and higher)



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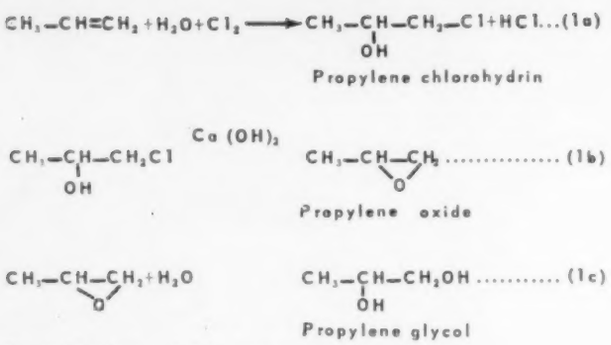

Fig. 1—Reactions underlying the commercial synthesis of propylene oxide and its glycol

chlorohydrins from ethylene chlorohydrin whereby a mixture of C_2-C_3 chlorohydrins is reacted with lime equivalent to the C_3-content to yield a product containing 90% propylene oxide and 10% ethylene oxide.

Porret[10] has shown that the saponification of propylene chlorohydrin is a second-order reaction. It is not, however, a simple reversible bimolecular reaction but appears to proceed in two stages analogous to the ethylene chlorohydrin saponification. As propylene oxide builds up in the system, the reaction rate decreases markedly, probably due to the formation of less readily saponifiable intermediate compounds formed between propylene oxide and propylene chlorohydrin. This effect can be avoided by operating at the saponification system's boiling point to assure nearly complete volatilization of propylene oxide as soon as it is formed.

In industrial operation, lime is supplied as an aqueous slurry containing about 10% CaO. This stream serves to neutralize HCl initially contained in the chlorohydrin solution, as well as to react with HCl evolved in the course of the saponification reaction. A slight excess of lime is used (pH should be between 8 and 9) to ensure more complete recovery of propylene oxide and to avoid corrosion difficulties in the saponifier.

Propylene chlorohydrin is supplied in the dilute solution in which it is obtained from the chlorohydrination reactor. Generally, it is freed of entrained gases before it joins the stream of lime slurry.

The combined chlorohydrin and lime stream enters the saponified. Here, it passes through several temperature zones ranging from 90 C to the boiling point. The lower initial temperature is chosen to prevent foaming of the system due to excessive reaction rates. The conversion is completed at the higher temperature levels. Operating pressure is only slightly above atmospheric.

The saponification reaction is highly exothermic, and causes considerable vaporization of the propylene chlorohydrin solution. At the same time, low-boiling propylene oxide is present mainly in the vapor phase and is withdrawn overhead. It is therefore practice to pass the gaseous reactor effluent through a partial condenser. This will retain propylene oxide and by-product propylene dichloride in the vapor phase while the chlorohydrin and most of the steam entering the dephlegmator will be condensed and refluxed to the saponifier. The gas leaving the overhead dephlegmator contains, in addition to propylene oxide and dichloride, some allyl alcohol and propylene chlorohydrin and is worked up in a series of fractionation columns.

A purge stream of reaction liquor must be continuously withdrawn from the saponifier. Typically, this stream contains 0.5 to 0.8% CaO. In addition, it contains about 1% of organic matter, principally glycols, which accounts for most of the loss of yield.

There are several types of saponifier in commercial operation today. A main problem in their design is the need to minimize erosion due to the lime particles and other solids which are present in the reaction system. Two types of saponifier—a horizontal and a vertical reactor—have been described elsewhere[11] for ethylene oxide service and the interested reader is referred to the original report on these units which are also suitable for propylene oxide production.

Hydrolysis of Propylene Oxide

Conversion of propylene oxide to its glycol (Equation 1c) essentially parallels the corresponding hydrolysis of ethylene oxide but the reaction rate for the propylene compound is about five times as great. The principal side reaction is the formation of dipropylene glycols. The conversion may be carried out in either the liquid phase or the vapor phase. Commercial technology is confined to liquid-phase conversion, employing either dilute acid or non-catalytic reaction with water at elevated temperature and pressure.

Effect of operating variables on liquid-phase hydrolysis of propylene oxide has been investigated by Ferrero[7] and, more recently, by Benham and Kurata.[12]

The non-catalytic reaction was found to be pseudo first order with respect to the propylene oxide concentration, while the sulfuric acid-catalyzed reaction is pseudo-second order. In addition to propylene oxide concentration, sulfuric acid strength and temperature have a very pronounced effect on reaction rate. For example, the velocity at 37.8 C and 10 lbs H_2O/lb propylene oxide is raised ten-fold when the sulfuric acid concentration is boosted from 0.05 to 0.2 wt-%.

In both the high-pressure and acid-catalyzed hydrolysis processes, conversion of propylene oxide is essentially complete. Yield of propylene glycol, however, depends principally on the water:propylene oxide feed ratio which controls the extent of di- and tri-propylene glycol formation. A high ratio favors the production of desired propylene glycol but also takes up considerable reactor space and yields a very dilute product of the hydrolysis stage, thus contributes to the cost of the concentration step.

Illustrative of this effect are the following data due to Ferrero:[7]

	% PrO Converted to:		
H_2O:PrO	Mono	Di	Tri
5:1	60.0	26.0	14.0
12:1	79.0	18.0	3.0
25:1	90.0	9.0	1.0

Various acid catalysts have been proposed for the reaction. Benham[12] uses dilute sulfuric acid, which is the preferred catalyst in ethylene oxide hydrolysis. Ferrero[7] favors the use of oxalic acid because, unlike sulfuric acid, it can be removed from the end product quantitatively by precipitation with lime. Robeson and Webb[13] recommend the use of weak acids, such as carbon dioxide and methyl formate, to avoid corrosion while operating below pH of 6.5 which is necessary for complete conversion (with such catalysts, however, the high temperatures and pressures of non-catalytic hydrolysis must be approached). More recently, liquid phase hydrolysis has been developed (on an experimental scale) to include catalysis by acid ion exchange resins suspended in aqueous medium.

In industrial versions of the acid-catalyzed process, propylene oxide is dissolved in water which has been acidulated by about one-half wt-% sulfuric or oxalic acid. The reaction is carried out at 50-70 C. and the solution is then passed to neutralization and purification stage.

Lime may be used at the neutralization stage to precipitate calcium sulfate or oxalate which can be filtered from the dilute aqueous glycol solution. In the case of sulfuric acid catalysis, however, some unprecipitated organic sulfuric acid compounds are formed which are separated only during the subsequent evaporation and distillation and cause charring and product contamination at this stage. The problem may be alleviated by after-treating the neutralized liquor with an anion-adsorbing exchange resin or by carrying out the entire neutralization with such resins.

The corrosive conditions and product purification problems which characterize acid-catalyzed processes for propylene glycol production, may be avoided by carrying out the hydrolysis in neutral water at high temperature and pressure. In this method, high temperatures (170-200 C) and correspondingly high pressures are required. Drawbacks of thermal hydrolysis include a somewhat lower glycol yield and the need for high-pressure equipment.

The reaction product is adjusted to a pH of 7 by addition of caustic soda and is passed to a multiple-effect vacuum evaporator for concentration of the glycols. Final purification and separation from the higher glycols

(Continued on page 75)

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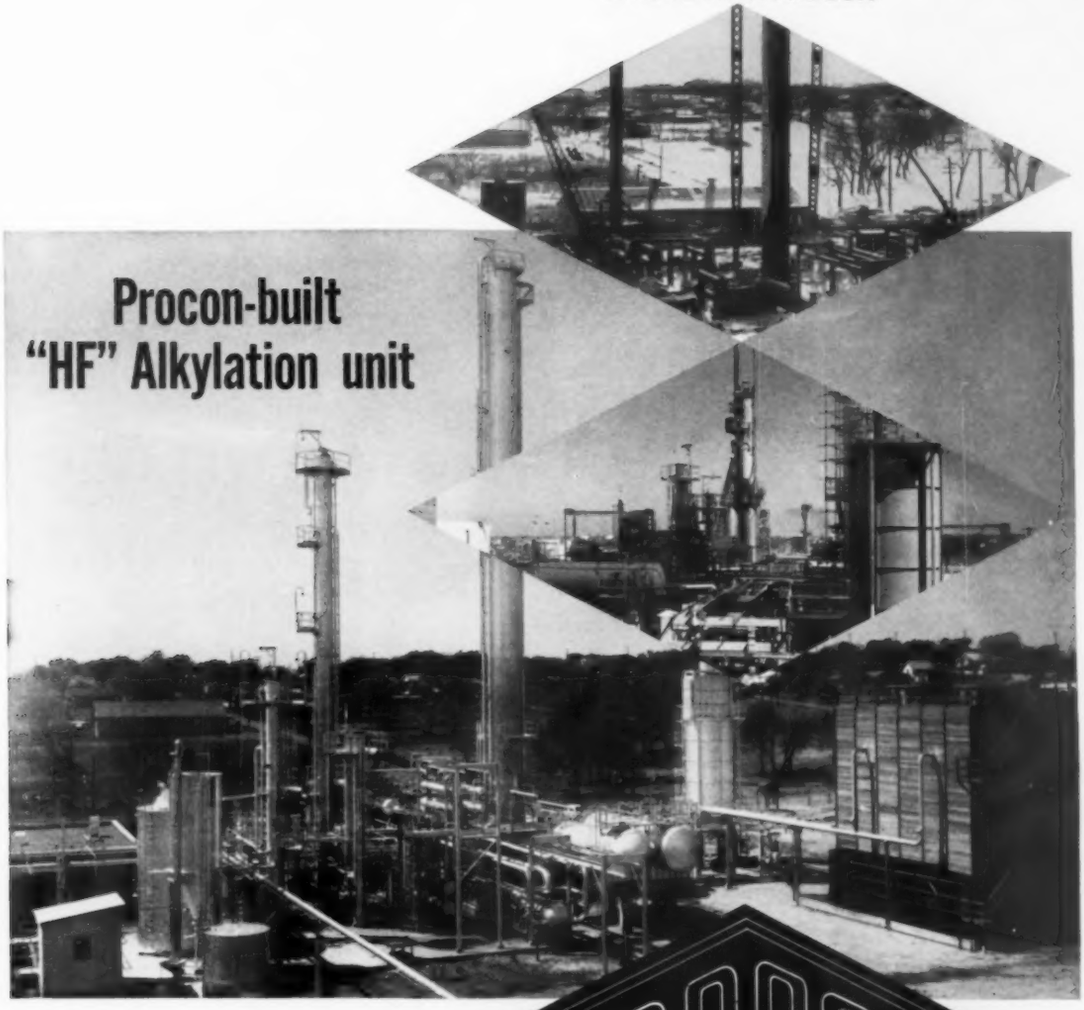

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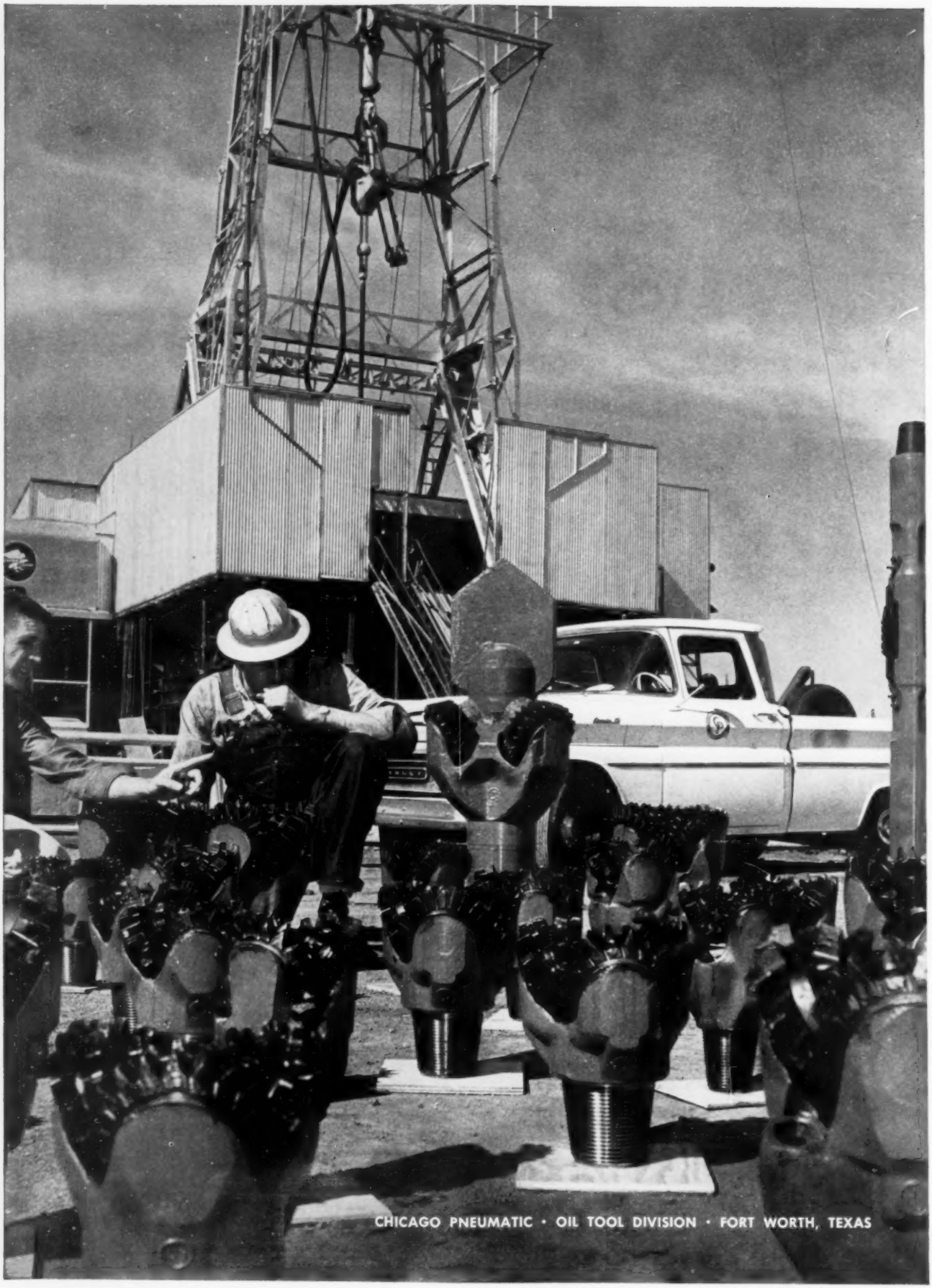
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(*Continued from page 72*)

is effected in a train of vacuum fractionators.

Propylene Oxide by Partial Oxidation

Chlorohydrination as a manufacturing method for ethylene oxide has declined in importance during the last ten years. Principally responsible for this development have been rising chlorine prices, growing availability of low-cost concentrated ethylene and insufficient expansion in markets for by-product calcium chloride. Under these pressures, the emphasis has shifted in increasing measure to partial oxidation of ethylene for which economic technology has been known since the early 1930's.

The same pressures are making themselves felt in the production of propylene oxide via the chlorohydrin route. But in this instance, no economically satisfactory oxidation process has so far been developed, as has been discussed above.

Because of the significant potential of a direct oxidation process for propylene oxide synthesis, however, considerable research work toward such a development is underway. To date, only little success has been reported; yields, throughput, or perpass conversions are too low, and the complexity of the oxidation product creates major separation problems. Because of the extensive interest in this area, however, a brief report on the present status of direct oxidation in propylene oxide synthesis is in order.

Investigators at Celanese Corp.[14] have studied means for increasing propylene oxide yield in the non-catalytic vapor-phase oxidation of C_3-C_4 hydrocarbons. This is a logical extension of the vapor-phase oxidation process for the manufacture of aldehydes, alcohols, ketones, etc. which is in commercial operation of Celanese Corp.'s Bishop, Texas plant.

Raw material is a mixture of propylene and propane which is reacted with oxygen at 350 C (initiation temperature) to 500 C and about 100 psi. Reaction time is about 0.5 seconds, after which the reaction mixture is water-quenched immediately. Typical feed composition is 26% propylene, 17% propane, 3.2% oxygen and 53.8% inerts.

According to Robertson,[14] such a process is capable of yielding 8 moles propylene oxide per 100 moles hydrocarbon oxidized, or 13.3 moles per 100 moles propylene converted. By comparison, partial oxidation of 100 moles propane alone yields only two moles propylene oxide while the oxidation of propylene alone results in the formation of only 11.5 moles of the epoxide.

Along with the main product, propylene oxide, a number of other oxygenated chemicals are formed, among them acetaldehyde, methyl formate, etc. Methyl formate, in particular, presents a purification problem for close-boiling propylene oxide. For such a separation, Mitchell[15] calls for the saponification of the formate at alkaline conditions which result in minimum hydrolysis of propylene oxide.

It is evident that the low yield and complex purification problem impose considerable economic burden on this method for the primary production of propylene oxide. Furthermore, for reasons noted above, *catalytic* vapor-phase oxidation of propylene has not been found a suitable route to propylene oxide. Thus, work has been concentrated on the development of liquid-phase oxidation methods.

Sachs[16] states that liquid-phase air oxidation of propylene under pressure permits production of propylene in approximately 50% yield. In addition, some acids (formic and acetic) and esters are formed, but recovery of these by-products is not considered worthwhile.

More detail on liquid phase oxidation is provided by Gardner.[17] In this process, the oxidation is carried out in benzene; manganese propionate is the catalyst, and air is the oxidizing agent. A critical requirement for good yield is the maintenance of low propylene oxide and water concentration in the solvent. Toward this end, a sidestream of reaction medium is circulated continuously between the converter and a stripper. En route, acids formed during the oxidation are neutralized to minimize hydrolysis. As a further refinement, Robertson[18] claims that propylene oxide yield can be raised by adding propane to the propylene feedstream. Typical reaction conditions are 175-225 C and 300 psig, oxygen-propylene:propane ratio of about 1:1:1.

At these conditions, Robertson reports the following products per 100 grams of hydrocarbon consumed: 39.8 grams propylene oxide (28.5% theory), 22.9 grams propylene glycol (12.6%), 19.3 grams C_1 to C_4 acids, 12.3 grams polymeric materials, 68.1 grams carbon oxides, 30.3 grams other products.

Although these are not optimum conditions, it is evident that realization is still far below the yield of 65-68% which is obtainable in the oxidation of ethylene to its oxide. Furthermore, the product mixture is more complex in propylene oxidation. It is for these reasons above all that, at this writing, the chlorohydrin route is still paramount in the manufacture of propylene oxide from propylene. END

BIBLIOGRAPHY

[1] Anon., *Chem. & Eng. News*, October 10, 1960.
[2] Messing, R. F. and Bradley, J. W. *Chem. Eng.* September 5, 1960 pp. 60-70.
[3] Smith, L. et al. *Acta chem. Scand.* Vol. 5, 1415-6 (1951).
[4] Etlis, V. S. and Grobov, L. N. *Zhur. prikl. Khimii* Vol. 32, 874-7 (1959).
[5] Curme and Young, U.S. 1,459,916 (1918).
[6] Morrell, C. E. et al. U.S. 2,436,591 to Standard Oil Development Co., Feb. 24, 1948.
[7] Ferrero, P. et al. *Ind. Chim. Belge* XIX, 113 (1953).
[8] Domask, W. G. and Kobe, K. A. *Ind. Eng. Chem.* Vol. 46, 680 ff. (1954).
[9] Heard, J. R. U.S. 2,417,685 to Wyandotte Chemicals Corp. March 18, 1947.
[10] Porret, D. *Helv. Chim. Acta* Vol. 30, 701 (1947).
[11] Goepp, R. M. et al. FIAT Final Report No. 874 (1947).
[12] Benham, A. L. and Kurata, F. *J. A. I. Ch. E.* Vol. 1, 118-124 (1955).
[13] Robeson, M. O. and Webb, T. P. U.S. 2,623,-909 to Celanese Corp. of America. December 30, 1952.
[14] Robertson, N. C. and Mitchell, R. L. U.S. 2,689,253 to Celanese Corp. of America. September 14, 1954.
[15] Mitchell, R. L. and McNair, W. T. U.S. 2,550,847 to Celanese Corp. of America May 1, 1951.
[16] Sachs, A. P. *Chimie et Ind.* Vol. 83 No. 2, 233 (Feb. 1960).
[17] Gardner, J. H. and Tewksbury, C. I. U.S. 2,784,202 to Escambia Chemical Corp., Mar. 5, 1957.
[18] Robertson, N. C. U.S. 2,780,634 to Escambia Chemical Corp., Feb. 5, 1957.

Mexico's Oil Laws

by Roscoe B. Gaither

ROSCOE BRADLEY GAITHER is the author of the well-known work on Mexican oil, *Expropriation in Mexico, The Facts and the Law*, published in 1940, as well as various articles on Mexican law published in law reviews and petroleum journals. Born in 1894 in El Paso, Texas, he is a resident of Mexico City, where he is a member of the "Academia Mexicana de Jurisprudencia y Legislacion Correspondiente de La de España," as well as of the New York Bar and the American Bar Association. He is now in private practice in Mexico City.

MOST PEOPLE familiar with the history of Mexico look with approval on the Mexican Revolution, but like all revolutions or civil wars it often takes a generation or so to ease the bitterness and the reconstruction.

When the Spanish conquered Mexico they interrupted a civilization that was based on a government of laws and justice. Land ownership was as clearly defined as any law that existed at the time in any country, and therefore to permit the seizure of private property and of communal property the Spanish destroyed all records of ownership by the Mexicans.

For four hundred years or so the natives were not permitted to own land, and there is no people who love land more than the Mexican. Porfirio Diaz realized this and bought large tracts from the Spanish descendants but instead of going back to the pre-Spanish communal system, he gave individual titles to heads of families. Descendants of the original grantees own these lands today and it is most difficult if not impossible to buy fee from them.

The revolution established the "ejido" or communal system where land is seized from the large owners and title vested in the government. The occupants are permitted the right of tenuous occupancy, similar to, if more unstable than, the law under the pre-Spanish system.

Railroads were taken over, some by purchase and some by the simple method of expropriation. Then oil was expropriated in 1938 and eventually passed to a discentralized government institution known as Petroleos Mexicanos. Lately the Mexican Light and Power Co. was purchased through the buying by the government of most of the stock of the company. This company, which supplies light and power to the Federal District and environs, now belongs to the government.

The new mining law, while not retroactive, requires Mexican majority control of all mines and concessions and of all mining companies. Gradually the larger mining companies are being taken over by Mexican capital, not necessarily by the government itself.

Foreigners cannot go into the oil business nor may they purchase land along a 50 kilometer strip of the coast or 100 along the border. Mexican control is required of all transportation within Mexico, fisheries, bottling of refreshments, rubber manufacturing, newspapers, radio and transmission and some other matters.

No one questions the right under the law for the government to purchase any industry or to regulate petroleum or the field of petro-chemicals or to pass new mining laws restricting foreigners but it is logical to question where this policy will lead Mexico in the future.

New Oil Law: On the 29th of November 1958 a new and very brief petroleum law was published. After repeating the Constitutional precept that all petroleum in National territory—meaning Mexico in its entirety, including the Continental Shelf belongs to the government and can not be sold and no prescriptive title can be granted, the law states only the Nation can develop oil, thus eliminating even the theoretical right existing in prior laws of Mexican nationals to develop oil.

Oil development is defined as exploration, exploitation, refining, transportation, storage, distribution and sale first hand of oil, gas, and products which may be obtained by their refining; treatment, storage, transportation, distribution and first hand sale of artificial gas; and treatment, storage, transportation, distribution and first hand sale of those oil derivatives capable of serving as basic industrial material.

The 1958 oil law, and its subsequent regulations, which appeared in the official Gazette on August 25, 1959, have been translated into English and are available, together with previous oil regulation in Mexico, from *Petroleum Legislation*, an established legal reference service which has translated the world's oil laws as well as the text of concessions around the world. Inquiries may be addressed to World Petroleum; however, the publisher may be contacted directly at the following address: *Petroleum Legislation, Post Office Box 1591, Grand Central Station, New York 17, New York.*

Petroleos may make contracts with persons or companies for work or services required to realize its objectives and payments provided such contracts shall always be for cash and work done shall never be paid by a percentage of the products or by a participation in the results of exploitation.

To explore a property only a permit is required from the Secretariat. If the owner should object then the Secretariat after hearing the parties will grant the permit but under a bond for possible damages to the property of the owner.

The President may create reserves for future supply. The creation of, and removal from reserves, shall be by Presidential order.

As before, the oil industry is Federal and the Federal government may regulate and tax as may be necessary or desirable.

And as before the oil industry carries with it the right of condemnation and public utility. All use of the surface rights and subsoil may be expropriated as required by the necessity of the industry.

In the transitory articles of the law it is provided that existing concessions (all, of course, privately owned) may be assigned to Petroleos or incorporated in reserves. These are confirmatory concessions mostly granted in perpetuity and based upon various treaties and conventions.

It is also provided that the government will pay the corresponding indemnity to be fixed by mutual agreement or if the amount is not satisfactory then by judicial decision.

The holders of transportation, storage and distribution contracts made under the law of 3 May 1941 may choose to be paid indemnity for cancellation of the contracts or to make a new contract with Petroleos for which, under equal conditions, they shall have preferential rights.

Any person (not Petroleos) who performs

(*Continued on page 80*)

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MANUFACTURERS - CONSTRUCTORS - CONTRACTORS

INTERNATIONAL NEWS AND NOTES

ANGOLA—Crude production in 1960 was 66,848 long tons, and crude oil processed in refineries was 183,723 tons. Fuel-oil production was 97,506 tons; gasoline output 28,085 tons; gas-oil output 48,882 tons; kerosine output 3,216 tons; and butane gas output 423 tons.

AUSTRALIA—Gas shows have been encountered between 4,956 ft and 4,963 ft in Frome Broken Hill's Port Campbell No. 3 in Western Victoria. Drilling ceased at 5,530 ft—with electric logs run and 5½-in. casing set at 5,080 ft. Testing continues.

AUSTRALIA—Australian government has approved nine oil-search subsidies, totaling $1,200,000, under the Petroleum Search Subsidy Act. Two are for oil drilling, five for seismic surveys, one for a gravity survey, and one for an aeromagnetic survey. Subsidy payments for oil search in 1961-62 will total $3 million. Since the subsidy scheme started in 1957, the government has paid out $8 million in 74 projects.

Subsidies recently approved include one to the Australian Gas and Oil Corp. for a seismic survey in the Sydney basin, one to Union Oil Development Corp. for an aeromagnetic survey at Morro-Miles in NSW and Queensland (Surat basin), one to Phillips Petroleum Co. for drilling at Chickavilla in the Great Artesian Basin. Geosurveys of Australia Ltd. has been granted a subsidy for a site survey in the Simpson Desert of the Northern Territory.

AUSTRALIA—United Australian Oil Co. Inc—with authorized capital of $2,800,000—has been incorporated in the USA. Corporation Trust Co., 100 West 10th St., Wilmington, Del., is serving as the principal office.

AUSTRIA—Reparations deliveries to USSR in 1960 averaged 41% of Austria's domestic crude production, or 19,224 b/d. Imports from the Soviet Bloc in 1960 equaled 50.4% by volume and 33.3% by value of Austria's total product imports—of which one-third (mostly fuel oil) came from Hungary. Next biggest suppliers were Czechoslovakia and Yogoslavia—with minor quantities from East Germany and Poland. Austria's product imports in 1960 from the Soviet Bloc totaling 616,138 metric tons were valued at $12.2 million (495,929 tons worth $11.2 million in 1959).

COLOMBIA—The new oil law, which amends Colombia's basic Petroleum Code, has been signed by the country's president. It wipes out 50-50 profit sharing, and newcomers will have to pay stiffer prices for oil rights. Concessions already in effect are expected to be affected at least to some degree by the new regulations.

CUBA—Cuban Petroleum Inst. reports Cuba's total crude production in 1960 dropped 20.5% under 1959, while Bacuranao field output alone dropped 80%. Income from nationalized oil operations during 1960 is estimated at under 17 million pesos—including that from operations at refineries formerly owned and operated by Esso, Texaco, and Shell, as well as from about 2,800 retail outlets, and LPGas business.

FRANCE—By trade agreement, France will import during 1961 about 5,800 b/d of Romanian crude, against 5,600 b/d in 1960. The trade agreement extends through December 1963, but oil trade has been fixed only for 1961.

GABON—Mobil Oil and SPAFE, its French affiliate, will spud an offshore wildcat in the Gabon, the first such test in the Franc Zone, next August. The partners plan a 16-month drilling program on marine structures near existing onshore oil fields.

FRENCH SAHARA—In a well in the northern Sahara significantly testing oil of a different quality from Hassi Messaoud, Africa Cities Service (Cities Service subsidiary with French affiliates PREPA and FRANCAREP) reports a "substantial show of 40-gravity crude between 12,608 ft and 12,625 ft in what is thought to be Triassic sandstone." The well is about 300 miles southeast of Algiers and 80 miles northeast of Hassi Messaoud field. Further testing is required to evaluate well. Should the well prove to be part of a new oil field, the crude may be better suited to the European demand pattern than Hassi Messaoud crude.

INDONESIA—In the North Sumatra fields formerly owned by Shell but now held by the Indonesian government company, Permina, the Japanese will spud their first test. The Japanese are financing development of the fields through North Sumatra Oil Development Co. and will be repaid in oil, obtaining 40% of the increased production for 10 years. They hope to move some 315,000 bbl of crude to Japan during 1961, with shipments to start in October.

INDONESIA—Refining Associates, of Long Beach, Calif., will advance the Indonesian government $4 million for construction of a carbon-black plant at Rantau, about 62 miles north of Permina's Pangkalau Brandan field in North Sumatra. Permina, the Indonesian government's oil company, will repay the California firm in crude, which the American company will sell in Japan.

IRAN—The Iranian consortium of international oil companies has reported record oil exports during 1960 increased Iran's direct oil revenues by 8½% to $285 million. In addition, the companies brought in $68.4 million in foreign exchange for local expenditures totaling over $84 million. The consortium's 1960 production increased 14% to 1,048,000 b/d. Crude exports were up 16%, product exports up 9%, and deliveries for use in Iran up 11%.

IRAQ—Saleh Koubbah, managing director of Iraq Maritime Transport Co., has been named by the Iraqi government as Iraq's member on the board of governors by Iraq's Oil Minister Mohammed Salman, Koubbah will also retain his present post. Iraq plans a permanent consular representative in Geneva, Switzerland, OPEC headquarters.

IRISH REPUBLIC—Three USA oil companies—Continental, Ohio, and Ambassador—plan oil and natural gas explorations throughout the Republic of Ireland. Ambassador negotiated an exclusive exploration agreement with the Irish Government which became effective in 1960, and participation by the other two firms is subject to government approval. Ambassador will be the operator. The contract covers the entire Republic, about 20 million acres of land and offshore area, virtually unexplored for oil and gas.

JAPAN—First import of Australian fuel oil into Japan arrived in Kobe recently for the leading firm of Kanematsu Trading Co. Shipped by British Petroleum Co., from its Kwiananna refinery in Western Australia, were 11,375 tons of heavy bunker "C"; and another 40,000 tons are to arrive in Japan from Australia. These shipments are part of proposed annual imports between Japanese firms and BP of 240,000 tons by year-end 1961—with negotiations under way for import of another 200,000 tons annually. BP intends to supply the Japanese firms with Australian oil instead of oil from some of its usual shipping ports such as those in the Middle East.

JAPAN—Barring currency aid to Japanese firms, the Japanese government has placed its own Arabian Oil Co. on same footing as British and American competitors with respect to crude imports into Japan. In an action strongly contrasting with that of some other oil-consuming nations, the Japanese Minister of Trade & Industry has ruled that Arabian Oil's crude imports into Japan must be paid for out of foreign currency, rather than allowing them to be traded as so-called "yen" imports which have meant they could have been purchased with local Japanese currency. This decision came practically on the eve of the first official shipment of crude from Arabian's offshore producing area in the Persian Gulf to Japan. However, there may be a catch to the so-called equality. It is understood that government officials in Japan are privately telling the major oil companies with refineries there that they must either refine a pro-rata share of the Arabian Oil Co.'s crude, or have their import currency allocation cut accordingly—either alternative being highly unfavorable from the standpoint of the companies which have spent years in Japan building up their refining and marketing operations.

LEBANON—Cie. Libanaise des Petroles' 50% German partner, Gewerkschaft Elwerath, has suspended exploration with abandonment at 7,052 ft of its second Adloun test in southern Lebanon. Firm's first test, northeastern part of country, also was abandoned at about same depth.

LIBYA—The German firm Elwerath has applied for a second Libyan concession. It is in the Fezzan, between Deutsche Erdoel's Block 77 and Ausonia Mineraria's Block 85.

LIBYA—Second discovery on concession on 26 in western Libya by Oasis Oil Co. is D1-26, which swabbed 25 to 50 bbl per hour of 33-gravity crude at 4,300-ft. It is 77 miles northwest of A1-26 completed in 1960 at 5,700 ft for 500 b/d.

MUSCAT & OMAN—Shortly after abandonment by Dhofar-Cities Service (the operator) of its 23rd test, the company in which Richfield holds a 50% interest suspended search in Dhofar province, southernmost part of Muscat & Oman. The companies will retain their concession, which covers the whole of the 32,000-square-mile province. Whether drilling will be resumed by the companies in the future will depend on a study now being conducted.

NIGERIA—Crude oil production and exports are expected to reach two million tons (40,000 b/d) in 1961, with the opening of the oil terminal at Bonny. Exports in 1960 were 847,196 long tons against original estimates of 1.2 million tons.

SPANISH SAHARA—In the disputed Spanish Sahara (where Morocco has laid claim to portions of the areas), IPESA has been awarded a 620,000-acre concession by the Spanish government. IPESA (Investigacionces Petroliferas SA) is owned jointly by two American independents, Magellan Petroleum Corp. and Oil Investments Inc., the first independents to obtain a concession in the area. IPESA will be obligated to spend at least $1 million in the next six years. The IPESA concession is in Block 18, bounded on the north by a Phillips Petroleum Co. block and on the west by a block jointly held by General American Oil Co. and the Spanish government's Instituto Nacional de Industria.

TUNISIA—An early Tunisian-Italian oil exploration concession agreement will parallel in terms the joint ENI-NIOC (National Iranian Oil Co.) venture. All expenses until commercial oil discovery within Tunisia are to be borne by ENI (Italian State oil entity). Thereafter the Tunisian government will participate 50% in company and profits and also receive, as royalties, half of the remaining 50% of profits for a total 75% participation. The agreement also provides for a $20 million 20,000 b/d refinery (site to be determined) to cover Tunisian inland consumption plus some exports. Provision also is made for an undetermined number of sales outlets within Tunisia by Agip (ENI's marketing affiliate).

TURKEY—Shell has completed as a producer No. 3 Kayakoy, its second producer on the structure in southeastern Turkey. Located one-half mile northwest of the discovery, the new well tested 38-gravity oil; and the company has spudded another stepout one mile east of the discovery.

USSR—To provide new oil routes to Atlantic and Pacific, the Soviets plan (1) to put in partial operation by year-end 1961 the 2,800-mile Comecon system for carrying crude westward from 2nd Baku to the Baltic in eastern Europe; (2) to extend eastward all the way to the Sea of Japan the 2,300-mile Trans-Siberian system presently in partial operation from 2nd Baku deep into central Siberia.

VENEZUELA—Government source estimated Venezuela's March 1961 crude output at 2,980,000 b/d (actual 2,766,000 b/d in March 1960); February 1961 averaged 3,078,000 b/d (2,946,000 b/d year previous). New production record of 3,112,000 b/d was set in week of Feb. 22, 1961, up 10,000 b/d from previous high in second week of January. 1961 production through March 1 averaged 3,052,000 b/d, up 4.8% over average of 2,912,000 b/d corresponding 1960 period. Previous first two-month high was in Jan.-Feb. 1959, at 3,043,000 b/d.

New Pipeline Compressor Design

A revolutionary new pipeline compressor cylinder with improved acoustical system that eliminates separate external headers and their accompanying pulsation problems has been introduced by Clark Bros. Co., division of Dresser Industries, Inc. The new cylinder design, (Patent Pending) features "En Bloc" construction with headers cast directly into the cylinder body. The suction and discharge headers open to the sides of the cylinders and are directly connected to the lead-in, lead-out lines.

"En Bloc" construction has several advantages: (1) The built-in header eliminates pulsation problems, (2) compression losses are considerably reduced, (3) by reducing internal losses, the new design achieves more consistent volumetric efficiency, as well as lower horsepower requirements per million cubic ft of gas compressed, (4) minimum usuable header size is very drastically reduced. (for example, on a 19 inch bore lined to an 18 inch "En Bloc" cylinder, the minimum usable header size is 22 inches, calculated to be equivalent to a 40 inch diameter header mounted in the conventional manner), (5) with only one inlet and one discharge pipe—both down-connected and firmly attached to the foundation—pipe shake and compressor cylinder movement problems are eliminated, (6) pit or basement compressor station construction is not required. The unit foundation can be a simple mat with a slightly raised block.

"Go Anywhere" Tires

Oil hunters are going places they had never been with conventional trucks on tires that mush through fender-deep slush or cross soggy fields without bogging down or digging ruts. The rotund "go anywhere" Terra-Tires, built by Goodyear Tire & Rubber Co. have been placed on vehicles used by Shell Oil Co. in Texas exploration work.

Because the tires' "wide footprint" construction and low inflation requirements protect against bogging, seismic crews can continue work immediately after rain without fear of miring equipment in muddy fields, Goodyear said. Previously, rain inactivated crews for weeks and even months. In addition, Shell can assure property owners that their land will not be weakened for erosion by heavy equipment chewing ditches in the soil. Terra-Tires exert only slightly more pressure on the ground than the 4 to 10 pounds per square inch with which they are limited.

Aluminum Gas Line

Pipeliners, working a weld and drag pipelaying method never before attempted in the rugged USA mountains, have completed the Appalachian gas fields' first permanent aluminum line. United Fuel Gas Co., Charleston, W. Va., now operates the four-inch pipeline as part of a gas-gathering network, tieing UFG wells to a cross-country transmission system. Aluminum Co. of America supplied all pipe for the installation, which saw a welded pipeline dragged snakelike over two mountains.

Eastern Kentucky was selected purposely by UFG and Alcoa engineers to test handling and laying procedures, and to evaluate aluminum's corrosion-resistance under a wide range of operating conditions. The weld and pull pipelaying method, adapted for use in rough terrain, was employed by the H. B. Ranier Construction Co., Prestonburg, Ky.

The aluminum line conects two UFG wells, separated by a straight line distance of 4,500 ft. To bridge the distance, and cross two mountains that rise between the wells, 5,700 ft of Schedule 40 Alcoa "Unistrength" pipe in alloy 6061-T6 were required.

Dresser Wins Award

The Oklahoma Society of Professional Engineers has selected the Dresser Engineering Co., Tulsa, as the recipient of its outstanding award of the year. The O.S.P.E. Industrial Professional Development Award is given each year to the company or firm selected as contributing most to the development of professionalism among engineers. The Phillips Petroleum Co. received the 1960 award.

Camdrill Appointment

Camdrill International Inc., subsidiary of Southern California Petroleum Corp., has appointed Robert G. Bundy, a vice president of Camdrill, as manager of Libyan operations. Bundy is a director of the parent company, and has acted as its secretary treasurer for the past 12 years.

Reflection on protection

The basis of Thermoglas protection is a reinforced glass fibre tissue impregnated for use with either coal tar enamels or asphaltic bitumen. Thermoglas pipeline Outer Wrap has met fully the requirements of major contracts both at home and overseas with such characteristics as strong adhesion and high tensile strength. In widths up to 36 inches to suit pipeline diameters, Thermoglas is one of a wide range of pipeline wrappings including Bestos Pipe Wrap manufactured to suit particular local conditions.

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Midwest Piping A Division of Crane

Stockholders of Midwest Piping Co., Inc. have approved the sale of substantially all their assets to Crane Co. The exact amount to be paid by Crane for Midwest's plant, property and equipment cannot be determined until final auidts are completed, but it is estimated the transaction will involve more than $18 million. The company will be known as Midwest Piping Division, Crane Co.

CB&I Appointments

George E. Borst, Philadelphia, and Edward S. Fraser, Hinsdale, Ill., have been elected directors of Chicago Bridge & Iron Co. They succeed H. C. Brown, New York, and Donald A. Leach, Ottawa, Ill., both of whom retired following many distinguished years as officers and directors of the company. Borst, a company vice president, is manager of CB&I's eastern sales region, and Fraser is CB&I's vice president in charge of manufacturing.

Dow Appointment

Charles M. Doscher has been appointed general sales manager, European area, for Dow Chemical International Ltd. S.A. He will direct and supervise all Dow marketing activities in Western Europe, as well as in the Near East and North Africa. He will report to Zoltan Merszei, vice president and general manager of European operations, and will assume his new responsibilities and move to Zurich, Switzerland early this summer.

Eastman In Tubular Testing

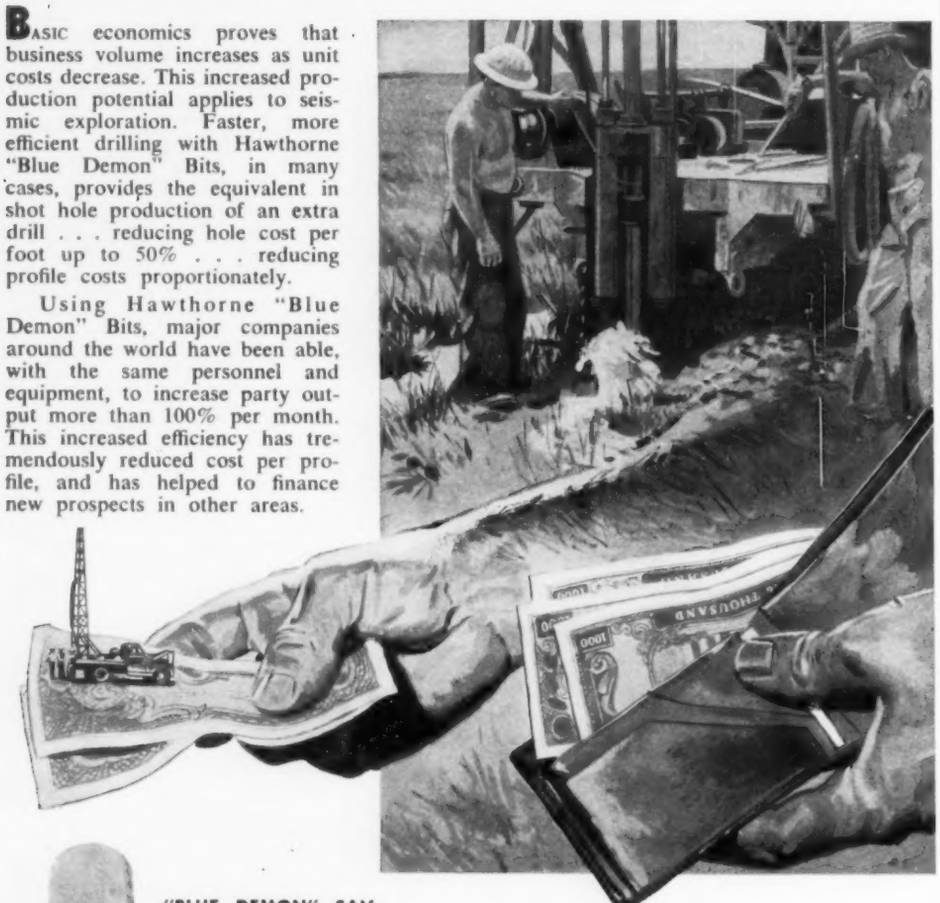
Eastman Oil Well Survey Co., Denver, Colo., has acquired Magna Scope Co., a new tubular goods testing and inspecting firm operating in the Permian Basin area, Odessa, Texas. Delbert R. Townsend, manager of the Eastman division, states that plans at present "are to expand the latest methods of inspection and testing services into other major oil producing areas in the United States."

ECONOMICS OF MORE EFFICIENT SHOT HOLE DRILLING — NO. 1

COST REDUCTION CREATES NEW BUSINESS
NEW BUSINESS CREATES NEW WEALTH

BASIC economics proves that business volume increases as unit costs decrease. This increased production potential applies to seismic exploration. Faster, more efficient drilling with Hawthorne "Blue Demon" Bits, in many cases, provides the equivalent in shot hole production of an extra drill . . . reducing hole cost per foot up to 50% . . . reducing profile costs proportionately.

Using Hawthorne "Blue Demon" Bits, major companies around the world have been able, with the same personnel and equipment, to increase party output more than 100% per month. This increased efficiency has tremendously reduced cost per profile, and has helped to finance new prospects in other areas.



"BLUE DEMON" SAVINGS WILL SUPPORT FUTURE DRILLING PROSPECTS

Drilling conditions will vary, but you can count on decreased costs per profile . . . increased party potential . . . in increasing crew efficiency with "Blue Demon" Bits.

WRITE FOR ILLUSTRATED CATALOG

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U.S. Patent Nos.
2,615,684
2,666,622
2,695,158
2,783,973
2,831,657
2,859,942
2,890,020
2,894,726

308

Mexico's Oil Laws

(*Continued from page 76*)

any petroleum activity shall be fined from $1,000 to $100,000 Mex. Cy., and if Petroleos should sell any petroleum right assigned to it, the officials of Petroleos and the purchaser shall be fined from $50,000 to $100,000 Mex. Cy. If a contractor is paid or an agreement is made by Petroleos to pay out of a participation or based on the results of exploitation, the contractor is fined from $1,000 to $100,000 Mex. Cy.

There is no doubt that this law and its regulation if attacked will be declared constitutional by the Courts. Gradually all private rights have been absorbed and the oil rights in the subsoil, the right to explore, produce, transport, distribute and sell the products is now completely controlled by the government.

The right to receive royalty for work done by private parties for Petroleos no longer exists, except in contracts made under prior law. When these existing contracts expire no further contracts will be made nor will they be renewed. Drilling is possible under footage contracts for cash and now Petroleos must risk dry hole money instead of private risk capital. END

M. G. McCool

McCool Resigns at AIMC

M. G. "Mac" McCool has announced his resignation as president of American Iron and Machine Works Co., Inc. He actually resigned about twelve months ago but agreed to stay on for a year! The effective date, April 4, 1961, rounds out 26 years with American Iron.

He will remain on the board of directors of American Iron and has also contracted to go on the payroll of American Machine and Foundry, the parent company in which he holds substantial stock, in an advisory capacity.

Dual Tension Tubing Head

A new dual tension tubing head that permits setting parallel strings of tubing in controlled tension under blowout-preventer control has been introduced by Oil Center Tool Co., Houston, Texas. The new head, which has been field tested for two years, is now in service on many wells. The DRT tubing head also permits manipulating and setting each tubing string independently.

Setting tubing in tension reduces tubing and rod wear that occurs in pumping wells with untensioned tubing. This advantage is especially important with parallel tubing because of the high cost of workovers in such completions.

The O-C-T DRT tubing head uses proved methods of sealing and supporting tubing. Both rams and sealing unit have direct, positive action. Both tubing strings can be run and set through blowout preventers with O-C-T DRT tubing head uses proved methods of sealing and supporting tubing. Both rams and sealing unit have direct, positive action. Both tubing strings can be run and set through blowout preventers with O-C-T Otis back-pressure valves installed. The annulus packoff is installed and activated before preventers are removed.

Lummus Names Wise

Ralph E. Wise, vice president and director of sales, has been named as a member of the board of directors of The Lummus Co. Wise, also assistant to the president, joined Lummus in 1945 and served abroad from 1950 to 1958 in successive posts as European sales manager, manager of engineering subsidiaries in Paris and The Hague and as European coordinator.

Foxboro Expands In Holland

The Foxboro Co., Foxboro, Mass., has completed a new instrument manufacturing and assembly building at the Foxboro (Nederland) N.V. plant in Soest, Holland. The new structure will permit a substantial increase in the production of standard Foxboro instruments supplied to industries in the European Common Market.

IDECO Appointments

W. O. (Bill) Cook and Gordon G. Wilbur have been named co-managers of Ideco Division of Dresser Industries, Inc.

Axelson Promotions

Four promotions have been announced in the sales department of Axelson-Garrett, division of U.S. Industries, Inc. J. P. Nielsen, to manager of product sales, responsible for pump and sucker rod lines in the USA and Canada. W. K. Woodward, a new manager of sales administration, will supervise over-all material controls, sales engineering and export sales. Neal V. Fowler, to manager of industrial sales, in charge of worldwide sales of relief valves and government and special contract sales. R. V. McAfee, to manager of sales promotion and training, including advertising, market research and analysis.

MEDARDO M. MARTINEZ appointed company sales representative for Latin America by The Ridge Tool Co., Elyria, Ohio.

WILLIAM C. BATES appointed export salesman for Johnston Testers, Inc., will handle sales of Johnston testing and completion tools in North Africa, the Middle East, Central and South America. He will headquarter at company offices, Sugar Land, Texas.

JOHN W. COLLINS named president of Grove Valve and Regulator Co., a subsidiary of Walworth Co., manufacturers of valves and regulators for the petroleum and aerospace industries. Collins has been senior vice president and chief executive officer for the company, and has been with Grove Valve for 18 years, serving as an officer since 1947.

JOSEPH G. EVANS has been made assistant manager of tetrethyl lead and planning for Du Pont's Petroleum Chemicals Division, succeeding Robert M. Glover, transferred to "Freon" Products Division.

ELMER E. RUBAC named president, American Iron & Machine Works Co., Inc., Oklahoma City manufacturers of oil well drilling equipment and a subsidiary of American Machine & Foundry Co. He succeeds M. G. "Mac" McCool who has resigned. Executive vice president of American Iron since 1951, Rubac joined the company in the billing department in 1937.

NORMAN B. CHAMP, Jr., elected a vice president of Crane Co. He will supervise the operations of the Midwest Piping Division, the Chapman Valve Manufacturing Co., Swartwout Division, and the Cochrane Division. His headquarters will be in New York City.

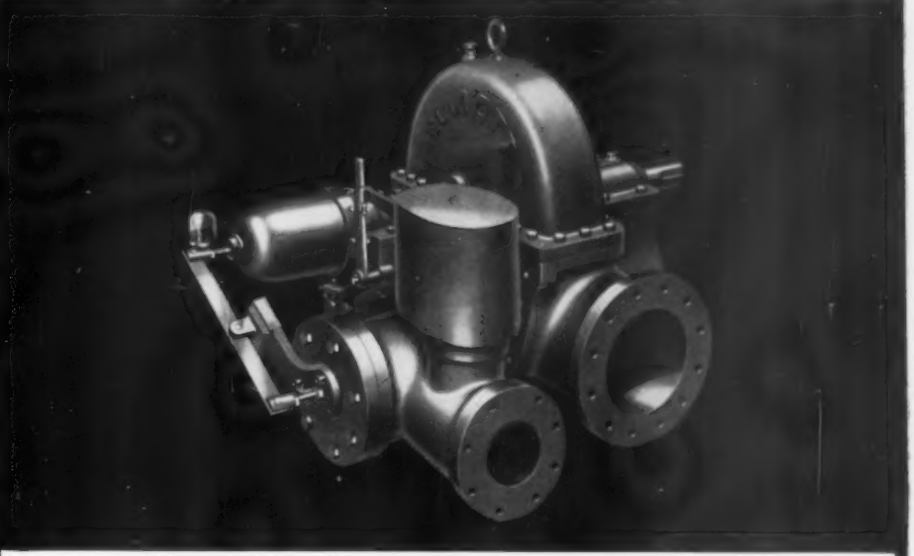
ROBERT M. (Bob) SMITH to special representative for Ideco Division of Dresser Industries, Inc., to cover the entire North American Continent, operating out of Ideco's Dallas headquarters.

HENRY A. PATE, from office manager, Kermac Drilling Co. of Venezuela, C.A., Mendoza, Argentina, to manager of foreign accounting for Kerr-McGee Oil Industries, Inc., Oklahoma City.

R. L. BOYER, vice president and director of engineering of The Cooper-Bessemer Corp., Mount Vernon, Ohio, has been elevated to the position of vice president of advanced planning.

ELLIOTT 2 hp to 2000 hp YR TURBINES

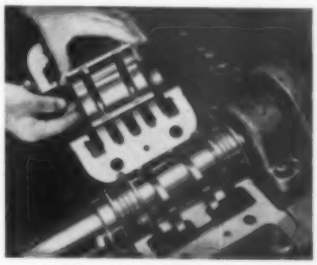
...where dependability is vital



Long-term dependability is of primary importance in small turbines—and that's one reason why Elliott YR turbines are outstanding in their field.

All-weather protection assures dependable operation under all conditions of heat, cold, moisture, dust and contaminated atmosphere. The direct-acting speed-governing system is simple and positive. The rugged rotor assembly is dynamically balanced. Bearings and shaft seals are readily accessible for maintenance. Hand valve reduces steam consumption at partial loads.

Throughout, YR turbine design simplifies installation and operation, encouraging an adequate program of routine inspection and maintenance. For example, the liner-type bearings (right) are easy to inspect and replace.



Other fine products of the Elliott Company include induction motors, synchronous motors, Crocker-Wheeler integral HP motors, motor generators, turbine-generators, ejectors, centrifugal compressors and strainers.

For information on any of these products, send this coupon to Industrial Equipment Sales Dept., Carrier International Ltd., 385 Madison Avenue, New York 17, N. Y.; Carrier A.G., Zurich, Switzerland, or Carrier-Lix Klett S.A., Buenos Aires, Argentina.

Carrier

Please send complete information on _____ (products)
to the following address:

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OIL COMPANY STAFF CHANGES

W. J. Zeman

J. G. McNab

WILLIAM J. ZEMAN elected vice president and general counsel and a member of the executive committee, Phillips Petroleum Co., succeeding **RAYBURN L. FOSTER,** who retired after 32 years of service.

WILLIAM C. KEEFE to vice president and secretary of Panhandle Eastern Pipe Line Co. and of its wholly-owned subsidiary, Trunkline Gas Co.

HAROLD T. CRUIKSHANK, JR. to deputy marketing coordinator, Standard Oil Co. (New Jersey). Cruikshank has spent the entire 26 years of his Jersey career in marketing activities. Prior to his recent appointment he was marketing advisor for Europe, the Mediterranean Area and West Africa. He assumed this post after a year as manager of Jersey's marketing development division. **W. H. JOHNSON,** assistant marketing advisor for France, Benelux, Austria, Germany, Switzerland and Italy, succeeds Cruikshank as marketing advisor for Europe, the Mediterranean Area and West Africa.

EVERETTE A. SKARDA has been named general manager of Dansk Veedol, Tidewater Oil Co., Danish-based subsidiary. He replaces **GEORGE M. DIXON,** who is returning to a new assignment with Tidewater in the United States.

GEORGE M. GEYER has been elected chairman of the southwestern district of the American Petroleum Institute's division of production for 1961-62. Geyer is district production superintendent for Cities Service Petroleum Co.

JOHN G. McNAB to the new position of chairman of new uses activities, Standard Oil Co. (New Jersey). Dr. McNab, formerly deputy to the vice president for petroleum products, medical, basic and analytical research at Esso Research and Engineering Co., will be responsible for the stimulation and coordination of research and investigative efforts in these fields by Jersey affiliate companies throughout the world. In addition, he will serve as chairman of a New Jersey committee, the New Uses Advisory Committee, the membership of which will be made up from major Jersey departments and representatives of Humble Oil & Refining Co. and Esso Research and Engineering Co.

C. W. PAINTER, senior partner of Messrs. Cravath, Swaine & Moore, New York, has been nominated, together with Mr. **A. CHARON,** who lately resigned as president of Shell Francaise, to fill vacancies on the board of the Royal Dutch Petroleum Co., which will occur through the resignation on June 30, of Messrs. **J. B. AUG. KESSLER** and **C. J. BARON COLLOT d'ESCURY.**

H. T. Cruikshank

P. L. Richards

Standard Oil Co. (New Jersey) has established a new chemical division in its marketing coordination department. **P. L. RICHARDS,** formerly assistant general manager of the cargo sales department of Esso Export Corp., Jersey Standard's international marketing affiliate, has been named as manager of the new division.

Active for a long time in the chemical field, both domestically and abroad, Jersey Standard expects its chemical activities to become increasingly important as the markets for oil-derived chemicals continue to grow. Present scheduled investment plans call for new chemical plants to be built in Canada and at several points in Europe and Latin America.

Mr. Richards, a graduate of the University of Massachusetts with a degree in chemistry, began his Jersey career in 1937 when he joined the Esso Research and Engineering Co. as a chemist. He later transferred to Esso Standard Oil Co., now a division of Humble Oil & Refining Co., as a technologist.

In 1950 he joined the Enjay Chemical Co., now the chemical products marketing affiliate of Humble Oil, where he served successively as assistant sales manager and sales manager of the alcohols and chemicals products sales division and later became assistant general manager of cargo sales department.

Mr. Richards is married and lives with his wife and three boys in Westport, Conn.

G. W. Poorman

GLENN W. POORMAN has been elected executive vice president of Esso Export Corp. Senior vice president for supply and a member of the board of directors, he will succeed **ROBERT H. MILBRATH** who has been elected president effective May 25. Announcement was also made of the election of **M. A. MATHESON** to the corporation's board of directors. He has, since 1958, been Esso Export's senior Eastern Hemisphere advisor in London.

C. W. Painter

F. D. Dennstedt

F. D. DENNSTEDT to assistant general manager of the new manufacturing division, Humble Oil & Refining Co. He had been assistant general manager of the Baton Rouge (La.) refinery. Other new manufacturing division appointments are: **P. E. KUHL,** to administrative coordinator from assistant general manager of manufacturing for Esso Standard; **F. A. YOUNGS,** to division controller from assistant controller of Esso; **F. M. DOUGHTY,** to manufacturing coordinator from manager of the technical division in Esso's manfacturing department; **C. H. KOLLENBERG,** to assistant manufacturing coordinator in charge of planning from manager of the coordination division at the Baytown refinery; and **J. P. COGAN,** to assistant manufacturing coordinator in charge of economic studies from assistant manager of the technical division in Esso's manufacturing department.

L. M. Ream, Jr.

P. E. Cundey

LOUIS M. REAM, JR. has been elected treasurer, and **PAUL E. CUNDEY** secretary, of The Atlantic Refining Co. They succeed the late Charles J. Reller, former treasurer and secretary, who died on January 28 of this year. Cundey will also continue to serve as assistant treasurer.

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On the city's most famous thoroughfare, 5th Avenue in exclusive Washington Square. Spacious single rooms from $10 daily. With air-conditioning from $12-$14. Lavish 2 & 3 room apartments with serving pantries. Television available.

SPECIAL RATES on a monthly basis. Additional substantial savings, on unfurnished and furnished apartments on lease.

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WILLIAM J. SHERIDAN to manager of Humble Oil & Refining Co.'s Bayway refinery, Linden, N. J., succeeding **G. ROSS MURRELL**, who has accepted a position with Standard Vacuum Oil Co. Sheridan, manager of the Everett (Mass.) refinery since 1959, has been succeeded by **JOHN J. COATES**, who has been manager of the Pittsburgh grease plant, and **ROBERT B. WINKEL** succeeds Coates at Pittsburgh.

CESAR A. CALDERON and **S. L. DESCARTES** have been elected to the board of directors of Commonwealth Oil Refining Co., Inc. The elections increase the Puerto Rico oil refiner's board membership to 12.

BERT FOLDA, Jr. appointed manager of new projects and studies for Mobil International Oil Co.'s manufacturing department.

S. MILLER WILLIAMS Jr.

S. Miller Williams Jr., 73, former Tulsan and one of the founders of Williams Brothers Co., died April 4 in Terre Haute, Ind., while on a business trip. Death was attributed to a heart attack. In 1908 Mr. Williams and his brother, David, formed the construction firm which became the pioneer in building steel pipelines across the country and which accounted for more than 40,000 miles of the nation's pipeline network.

Williams Brothers, with S. Miller Williams as president, was the principal builder of most of the first large utility gas pipelines, including those that brought natural gas for the first time to such cities as New Orleans, Memphis, Denver, Atlanta, St. Louis, Minneapolis, Chicago and New York. During the war the firm built the major part of the Big and Little Inch pipelines and the fueling system for the Panama Canal and for airfields in many parts of the world. The western portion of the Trans-Arabian Pipeline was one of the last major projects accomplished before Miller Williams' retirement.

A. H. Wooler

P. L. Myers

Hughes Elects Three to Board

Election of three executives of the Oil Tool Division to the board of directors of Hughes Tool Co., has been announced by M. E. Montrose, senior vice president and general manager, following a meeting of the board in Houston.

The newly elected directors are: Park L. Myers, assistant vice president-sales; Lyle L. Payne, assistant vice president-engineering; and Arthur H. Wooler, assistant vice president-manufacturing. Their election to the board follows a recent reorganization of the Oil Tool Division in which they were assigned increased responsibilities.

New Slim-Hole Pump Bulletin

A new bulletin on D/B slim-hole subsurface pumps, designed for 1¼, 1½ and 1¾ inch nominal ID tubing, now available from Continental-Emsco Co., describes standard pump assemblies including tubing size and pump bore, type of pump, and material used in barrel tube, plunger, cages and balls and seats. Also included is stroke length data, seating shoe, nipple and ring specifications, and D/B slim-hole pumps and tubular specifications. For copies of the bulletin write Continental-Emsco, Advertising Department, P.O. Box 359, Dallas 21, Texas.

L. L. Payne

J. C. Diehl

Diehl Wins Hanlon Award

The Hanlon Award, highest honor in the gas processing industry and one of the ranking awards of the petroleum industry, has been conferred on John C. Diehl, retired board chairman of the American Meter Co. The ceremony took place at the 40th Annual Convention of the Natural Gasoline Association of America in Dallas.

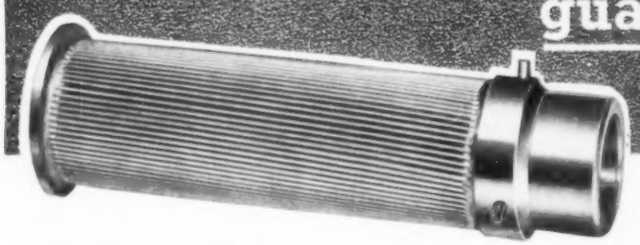
Diehl is the 25th recipient of the Hanlon Award, which is conferred annually by the NGAA for outstanding service to the natural gasoline and gas processing industries.

Tubing Heads Developed

A new line of Type M (for macaroni) tubing heads for 1½-in and smaller tubing has been introduced by Oil Center Tool Co., Houston, Texas. These new O-C-T tubing heads were designed to meet current needs for multiple and tubingless completion wellhead equipment. Type M tubing heads can be supplied with either flanged or threaded connections on top and bottom. Crescent flanges, tri-flanges, and quadruple flanges are available.

Three Type M tubing hangers have also been introduced for use in the new tubing heads, including a threaded hanger, a threaded hanger with back-pressure-valve grooves, and a stripper hanger.

Vokes new filter media with guaranteed 100% efficiency



POROLOY CM.

Vokes now introduce a new all metal filter medium of outstanding efficiency for the *controlled* filtration of hydraulic and lubricating oils, fuels, air, gases, acids, caustics and related caustic materials, chemicals and solvents at extreme temperatures and pressures. Poroloy CM filter elements can be made in any size or shape from a variety of metals—Stainless Steel, Inconel, Nickel, Copper, Steel and Nichrome being the most popular—features which, combined with special production techniques to give controlled pore configuration, enable filters to be individually designed for special applications. Metals can be selected with the particular requirements of the application in mind and the size of the pores can be controlled to deal with particles of between 2 and 250 microns. Poroloy CM filters are therefore 100% effective against a stated particle size, *the danger of media migration being eliminated by an accurately controlled sintering process.* The ultimate tensile strength of the elements varies from 2,000 to 60,000 p.s.i. and the operating temperature range is from —400°F to 1200°F.

The unique combination of properties found in Poroloy CM has led to its recent use in critical temperature conditions in the United States missile and aircraft industries, including installation in the Boeing 707.

POROLOY T.

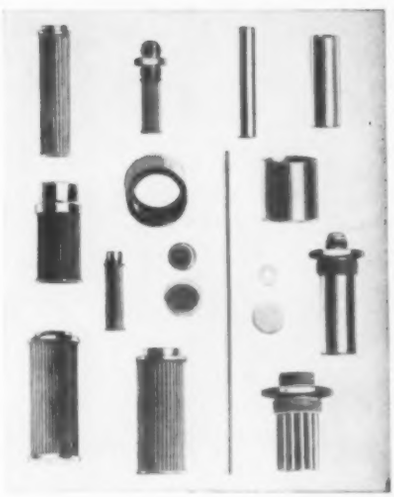
Similar in performance to Poroloy CM but manufactured by a different process, Poroloy T has an operating temperature range from —400°F to 1500°F. Pore size ratings are from 2 to 250 microns and tensile strength varies from 2,000 to 100,000 p.s.i.

This illustration shows the many sizes and forms—seamless tubes, flat discs, corrugated elements etc.—in which Poroloy can be manufactured.

Both filter elements are manufactured in conditions of micro-cleanliness and before despatch are individually checked for performance in bubble point testing equipment.

Poroloy was developed by the California Institute of Technology and is manufactured in the U.K. under license from The Bendix Corporation, U.S.A.

Write now for fully illustrated technical literature.



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World Petroleum Statistics

FREE WORLD SUPPLY AND DEMAND, CRUDE AND PRODUCTS, SEPTEMBER 1960

(Thousands of barrels)

Source: USA Bureau of Mines, Division of Petroleum

Country	CRUDE PETROLEUM					REFINED PRODUCTS			
	Production	Imports	Exports and reexports	Stock change, other demand, and loss	Total 1/ refinery input / Total 2/ refinery output	Imports	Exports and reexports	Domestic demand (incl. bunkers) 3/	Bunkers-all flags (as reported)
NORTH AMERICA									
Canada	15,654	11,734	2,673	+1,039	25,924	4,345	271	4/24,377	E/547
Mexico	8,630	-	206	-90	9,076	717	337	9,456	
United States (incl. Alaska and Hawaii)	209,119	32,691	234	-1,483	257,201	20,616	5,393	4/270,562	6,805
Subtotal	233,403	44,425	3,113	-474	290,201	25,678	6,001	304,395	
CENTRAL AMERICA AND CARIBBEAN									
Costa Rica	-	-	-	-	-	E/ 87	-	87	
Cuba	6	E/1,600	-	-	E/1,606	E/661	-	2,267	
Dominican Republic	-	-	-	-	-	E/219	-	219	
El Salvador	-	-	-	-	-	E/122	-	122	
Guatemala	-	-	-	-	-	E/274	-	274	
Haiti	-	-	-	-	-	E/ 84	-	84	
Honduras	-	-	-	-	-	E/122	-	122	
Jamaica	-	-	-	-	-	365	-	365	E/ 92
Nicaragua	-	-	-	-	-	E/105	-	105	
Panama, Canal Zone	-	-	-	-	-	867	189	678	454
Panama, Republic	-	-	-	-	-	E/254	-	254	
Puerto Rico	-	2,640	-	+123	2,771	439	1,551	1,659	
Subtotal	6	4,240	-	+123	4,377	3,599	1,740	6,236	
SOUTH AMERICA									
Argentina	5,766	1,751	-	+46	7,471	1,415	-	4/7,733	102
Bolivia	341	-	179	-61	223	9	5	227	
Brazil	2,666	4,627	-	+1,525	5,768	E/2,349	-	8,117	
British Guiana	-	-	-	-	-	232	-	232	
Chile	693	276	-	-82	981	E/528	-	1,509	
Colombia	4,355	-	2,290	-48	2,365	E/ 98	E/255	2,208	E/100
Ecuador	226	113	-	-22	361	11	-	372	
Netherlands Antilles	-	21,682	-	+362	22,732	E/1,374	E/19,242	4/4,864	E/1,793
Paraguay	-	-	-	-	-	E/ 61	-	61	
Peru	1,620	-	189	+139	1,403	285	143	1,545	16
Trinidad	3,639	5,098	933	+276	7,558	138	5,870	4/1,826	1,254
Uruguay	-	873	-	+27	848	86	-	934	E/ 78
Venezuela	86,859	-	62,479	-1,223	25,783	E/ 31	17,601	4/3,757	1,271
Subtotal	106,095	34,416	66,070	+939	75,493	6,617	43,116	33,385	
WESTERN EUROPE									
Austria	1,371	259	547	-113	1,243	E/680	E/ 91	4/1,796	
Belgium and Luxembourg	-	5,405	-	+908	4,542	1,800	1,318	5,024	317
Denmark	-	-	-	-25	E/ 25	2,893	7	2,911	159
Finland	-	E/650	-	-	E/650	1,263	1	1,912	
France	1,232	20,059	-	+748	20,555	1,039	4,652	4/16,718	1,016
Germany, West	3,283	14,975	-	-429	18,687	2,936	2,249	19,374	408
Greece	-	971	-	-57	1,028	434	-	1,462	
Iceland	-	-	-	-	-	276	-	276	
Ireland	-	974	-	-176	E/1,150	310	123	1,337	
Italy	1,203	18,254	222	+204	19,959	918	3,427	4/15,011	1,093
Netherlands	1,110	10,941	15	+1,390	12,032	4,626	7,757	8,901	843
Norway	-	-	-	-70	E/ 70	2,118	-	2,188	E/183
Portugal	-	1,126	-	+217	909	306	109	1,106	
Spain	-	E/2,549	-	-	2,596	E/ 47	E/118	2,525	E/201
Sweden	-	1,901	-	+203	1,698	6,122	53	7,767	E/247
Switzerland	-	-	-	-	-	2,733	1	2,732	
United Kingdom	55	27,778	-	+479	27,354	7,522	4,403	4/27,850	2,282
Yugoslavia	737	E/189	-	+205	721	E/150	E/ 49	822	
Subtotal	7,991	106,031	784	+3,484	113,829	36,173	24,358	119,712	
MIDDLE EAST									
Aden	-	3,550	-	+795	2,755	395	2,470	680	E/2,275
Bahrain	1,352	5,514	-	+34	6,832	1	5,909	827	374
Iran	33,936	-	21,808	+172	11,956	-	8,742	3,214	E/550
Iraq	31,427	-	E/30,295	-	E/1,132	E/ 1	-	1,133	
Israel	81	E/779	-	-	860	E/796	28	1,730	E/ 30
Jordan	-	-	-	-	-	E/118	-	118	
Kuwait	51,874	-	47,421	-138	4,591	-	2,283	2,308	1,982
Lebanon	-	454	-	-	454	E/ 33	-	487	E/ 67
Neutral Zone	4,184	-	E/3,700	-236	E/720	-	E/300	420	E/300
Qatar	5,198	-	E/5,180	-	E/ 18	-	-	18	
Saudi Arabia	37,473	-	29,859	+51	7,563	1	4,437	2,212	E/1,000
Turkey	217	-	-	+22	195	E/1,011	-	1,206	
U.A.R., Syria	-	E/423	-	-	E/423	83	-	506	
Subtotal	165,742	10,720	138,263	+700	37,499	2,541	24,069	14,859	
AFRICA									
Algeria (French Sahara)	5,790	-	5,488	+302	-	1,049	-	4/818	
Angola	44	-	-	-79	123	81	-	204	
Republic of the Congo	-	-	-	-	-	E/296	-	296	
Canary Islands	-	1,779	-	+664	1,876	1	1,259	618	573
Ethiopia	-	-	-	-	-	E/ 57	-	57	
States formerly in French Equatorial Africa	519	-	646	-127	-	E/178	-	178	
States formerly in French West Africa	-	-	-	-	-	E/1,001	-	1,001	E/660
Ghana	-	-	-	-	-	E/296	-	246	
Kenya	-	-	-	-	-	587	80	507	E/ 76
Liberia	-	-	-	-	-	E/ 32	-	32	E/ 3
Malagasy Republic	-	-	-	-	-	75	-	75	
Morocco	55	E/ 99	-	-	154	456	-	2/518	
Nigeria	580	-	572	+8	-	515	-	515	
Federation of Rhodesia and Nyasaland	-	-	-	-	-	E/329	-	329	
Sierra Leone	-	-	-	-	-	231	-	231	E/127
The Sudan	-	-	-	-	-	E/249	-	249	
Tanganyika	-	-	-	-	-	115	30	85	
Tunisia	-	-	-	-	-	199	-	2/199	
Uganda	-	-	-	-	-	76	13	67	
Union of South Africa	-	804	-	-15	819	E/2,230	E/ 93	2,950	E/310
U.A.R., Egypt	1,791	1,242	-	+199	2,834	E/596	E/123	1,307	E/185
Subtotal	8,779	1,924	6,706	+934	5,806	8,609	1,610	12,581	
SOUTH ASIA, FAR EAST, AND OCEANIA									
Australia	-	6,761	-	-245	7,587	1,115	1,281	4/6,750	758
British Borneo	2,856	-	1,371	-	E/1,485	88	1,246	321	74
Burma	388	-	-	+50	338	29	6	361	
Ceylon	-	-	-	-	-	377	-	377	235
India	255	E/1,574	-	-	E/1,829	847	288	4,388	E/930
Indonesia	11,609	E/864	5,505	+396	E/7,204	E/171	6,198	1,774	537
Japan	300	13,797	-	+257	14,812	4,180	306	20,566	E/1,265
Korea, South	-	-	-	-	-	E/402	-	402	
Malaya and Singapore	-	673	310	+393	-	4,918	806	4,106	1,493
Netherlands New Guinea	190	-	E/190	-	-	Insig.	-	Insig.	
New Caledonia	-	-	-	-	-	E/ 54	-	54	
New Zealand	-	-	-	-	-	823	-	823	E/430
Pakistan	177	-	-	-25	E/202	E/86	E/ 91	1,121	
Philippines	-	591	-	-139	721	E/854	-	1,570	E/ 11
Taiwan	1	869	-	+418	470	10	-	482	
Thailand	-	-	-	-	-	743	-	743	6
Vietnam, South (incl. Cambodia)	-	-	-	-	-	E/461	-	461	E/ 1
Subtotal	15,716	29,142	7,376	+562	33,674	14,189	10,230	43,962	
WORLD TOTAL EXCLUDING EASTERN EUROPE, U.S.S.R., & MAINLAND CHINA	538,732	232,905	222,252	+6,268	555,279	99,406	111,124	535,118	

E/ Estimate based on latest available data.
1/ Total input includes crude runs to stills plus runs of other unfinished oils, topped crude and natural gas liquids blended.
2/ Total output includes refined product output plus refinery fuel and loss; excludes liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
3/ Unless otherwise specified, data represent apparent domestic demand (including inland demand, refinery fuel and loss, and bunkers). Apparent domestic demand is derived from the components of refined product output, plus imports, minus exports, with no allowance for changes in stocks.
4/ Domestic demand as reported, including refinery fuel and loss, stock changes, and bunkers; also includes, where available, liquefied petroleum gases sold directly for fuel and chemical uses from natural gasoline plants.
5/ Apparent domestic demand is heavily influenced by refinery fuel and loss, and bunker loadings.

Earning Levels Snap Back

First quarter 1961 oil company earnings registered a sharp comback over the level for the full year 1960 as well as over the same quarter a year ago. Below are the returns from 53 companies. The total for 50 of them, compared on the basis of first quarter figures only, increased over 15%, from $742 million to $855 million.

OIL COMPANY EARNINGS, THREE MONTHS

(Totals in $1000's. Per share is for common)

	1961 three months	1961 per share	1960 three months	1960 per share
Amerada Petroleum	7.796	1.23	6.473	1.03
Apache Oil	220	.21[4]	132	.14[4]
Ashland Oil & Refining	3.570	.50	3.409	.49
Atlantic Refining Co.	14.870	1.60	8.726	.93
Barber Oil Corp.	(252)[2]	—	(191)[2]	—
Belco Petroleum	1.023	.19	848	.16
Canadian Petrofina	1.260	.20[3]	—	—
Champlin Oil & Refining	3.009	.71	1.874	.43
Cities Service Co.	14.752[4]	1.37	12.974	1.21
Colorado Oil & Gas	1.136	.32	(180)[2]	—
Columbian Carbon	1.760	1.09[5]	2.109	1.31
Commonwealth Oil & Refg.	3.275	—	(331)[2]	—
Continental Oil	16.037	.76	15.280	.72
Delhi-Taylor Oil	2.100	.41[1]	1.425	.27[1]
Eastern Gas & Fuel	2.631	.84	2.638	.84
Empire State Oil	554	.28	468	.24
Felmont Petroleum	2.119	.53	2.117	.52
Gulf Oil Corp.	95.315	.92	81.824	.79[4]
Hugoton Production	1.119	.31	1.408	1.66
Imperial Oil Ltd.	14.711	.47	15.705	.50
International Petroleum	8.400	.58	9.500[7]	.65[7]
McCulloch Oil of Calif.	76	.01	—	—
Murphy Corp.	1.307	.39[4]	1.148	.35[4]
Newmont Mining Corp.	2.955	1.05	2.863	1.01
Ocean Drilling	386	—	133	—
Ohio Oil	10.493	.75	10.279	.74
Phillips Petroleum	27.506	.80	25.804	.75
Pure Oil	—[9]	—[9]	6.702	.68
Quaker State Oil	251	.30	401	.49
Richfield Oil Corp.	5.243	1.34[4]	6.995	1.73[4]
Shell Oil Co.	34.709	.57	34.545	.57
Signal Oil & Gas	4.087	.41	3.369	.34
Sinclair Consolidated	16.096	1.06	12.647	.81
Sinclair Venezuelan	3.393	.84	3.038	.75
Skelly Oil	6.495	1.15	5.909	1.03
Socony Mobil	59.800	1.23[4]	47.200	.97[4]
Standard of Calif.	65.973	1.04	60.728	.96
Standard of Indiana	43.820	1.23	31.689	.89
Standard (Ky.)	2.975	1.14	3.398	1.30
Standard (N.J.)	193.000[4]	.89	170.000	.79
Standard (Ohio)	5.518	1.10	5.066	1.01
Sun Oil	12.011	.92	8.786	.71
Sunray Mid-Continent	11.007	.57	9.440	.48
Tennessee Gas Transm.	14.118	.30	12.310	.25[4]
Texaco	108.141	1.75	97.313	1.61
Texas Eastern Transm.	7.851	.67[1]	7.090	.60[1]
Texas Pacific Coal & Oil	1.799	.46	2.104	.54
Tex-Star Oil & Gas	388[10]	.51[1]	282[10]	.47[1]
Tidewater	10.979	.73	5.932	.36
Union Oil of Calif.	9.164	1.05	5.530	.60[4]
Universal Consol. Oil	1.073	1.13	676	.70
Wilcox Oil & Gas	210	.65	246	.78
Totals	854.701[11]		741.525[11]	

[1] On shares outstanding at end of period.
[2] Figures inside of parentheses are net losses.
[3] On preferred shares.
[4] Preliminary report.
[5] Excluding special credit of $696,000, equal to 43¢ per share.
[6] On shares now outstanding.
[7] After giving effect to non-recurring items.
[8] On average number of shares outstanding during period.
[9] Moderate increase over 1960.
[10] Six month total, to February 28.
[11] Totals only for complete 3-month earnings figures.

Humble Fleet to Houston

The headquarters of the largest privately-owned tanker fleet flying the American flag are moving soon from New York to Houston. Humble Oil & Refining Co., which last December announced plans to transfer its new Marine division to Houston, said today that the move is expected to be completed early this year.

Among those moving to Houston will be John D. Rogers, general manager of the Marine Division, James E. Stoveken and Sydney Wire, assistant general manager, ending completion of Humble's new 44-story office building in mid-1962, the marine division will be quartered in the Americana Building at Dallas Avenue and Travis Street. This division delivers 400,000 b/d of petroleum products and crude oil from ports on the Gulf of Mexico to the Atlantic Seaboard. It operates 24 tankers.

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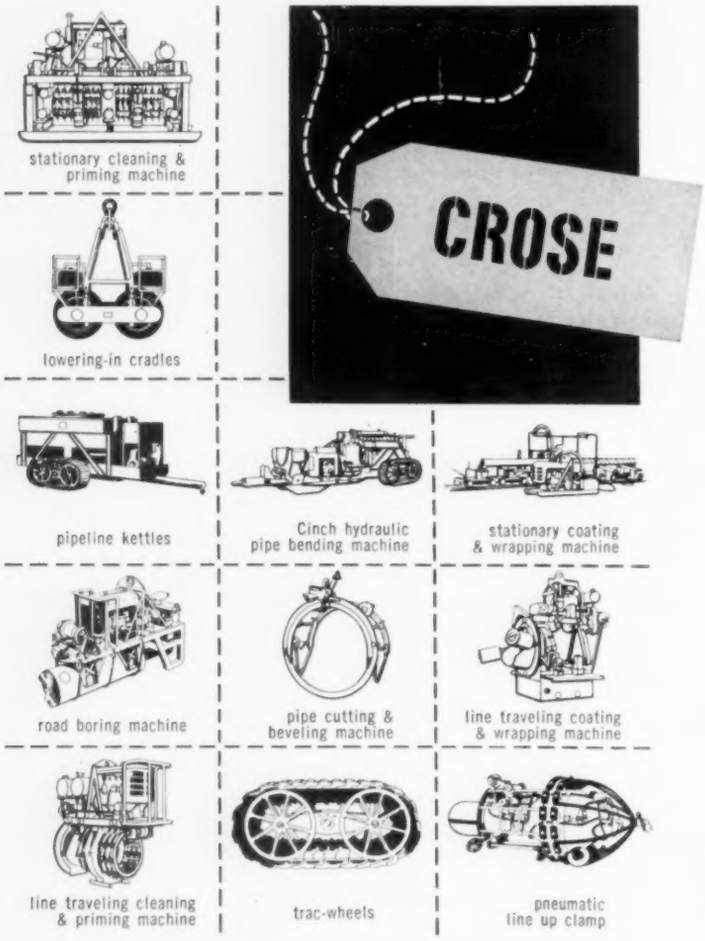

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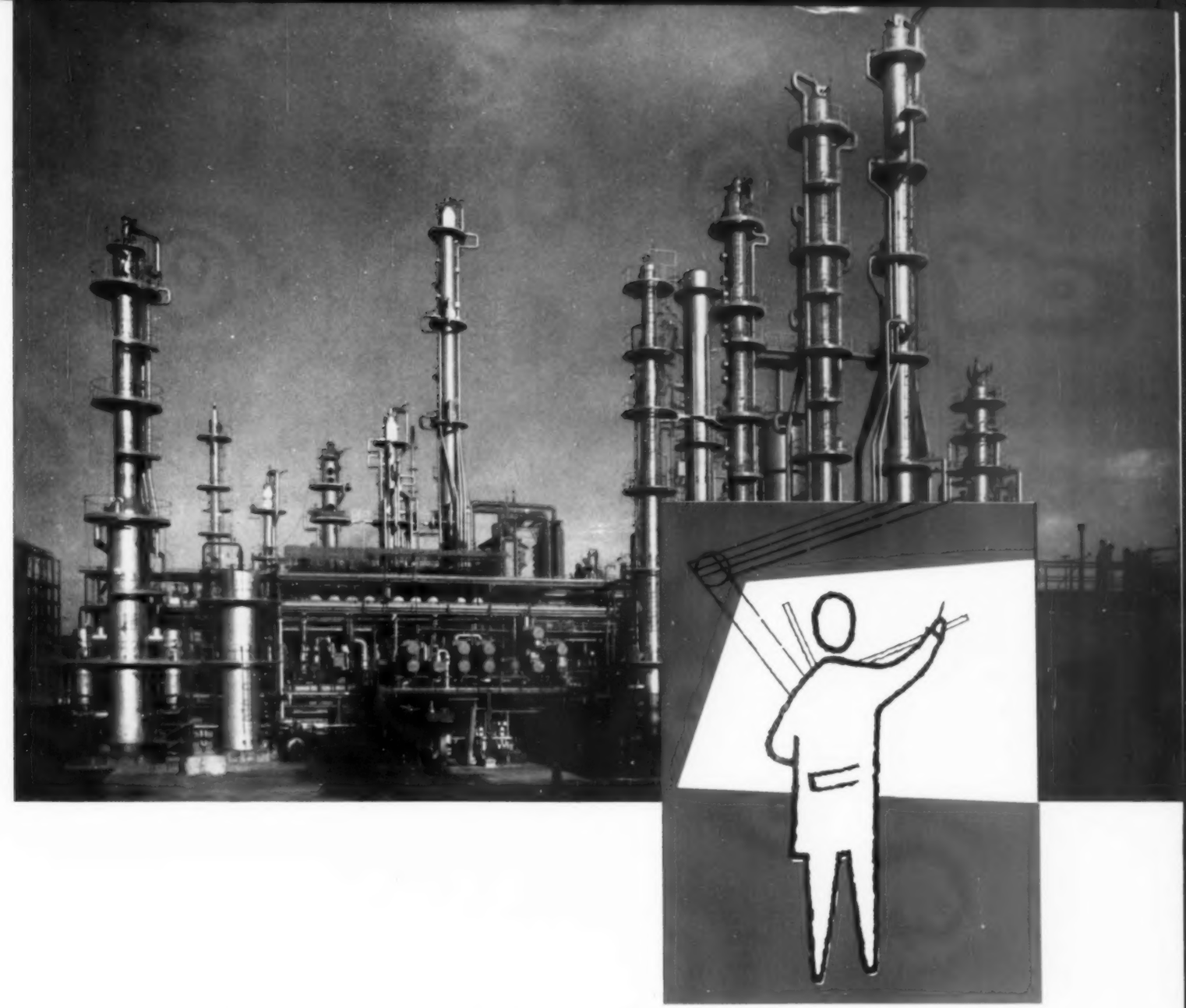

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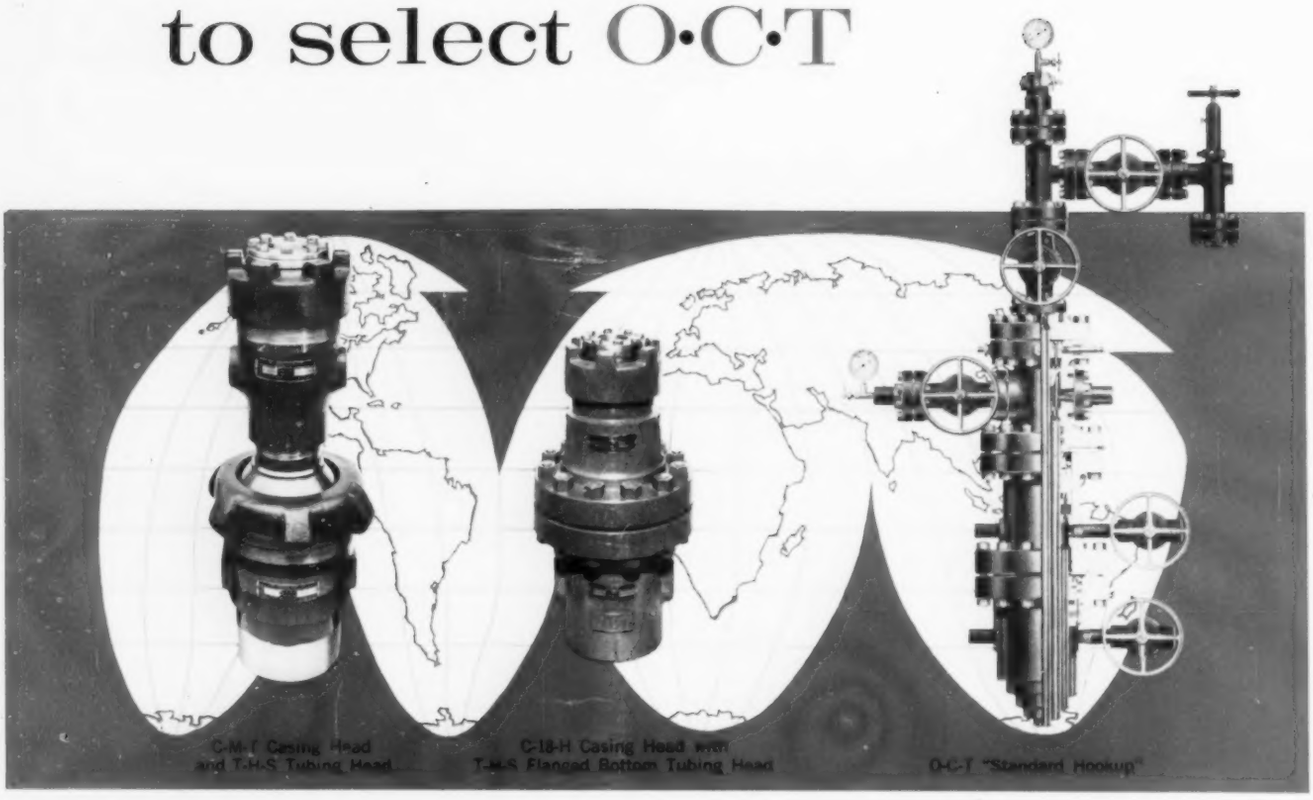

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